# Environmental Stewardship and the Yukon Department of Education

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## Introduction

The Yukon Department of Education began considering an Environmental Stewardship (ES) initiative in early 2008. The department wanted to build on the existing ES practices within Yukon schools, and were also inspired by the program developed by the Calgary Board of Education. In January 2008, a two day workshop, facilitated by Jeff Reading from the Calgary Board of Education, was held to develop ideas for implementing an ES framework within the Yukon Department of Education.

This report is the next phase in the process. The Department of Education requested a report that provided three things:

1. A review of Environment and Education Case Studies in other jurisdictions.
2. A review of current environmental stewardship practices in Yukon schools and the Yukon Department of Education.
3. Recommendations for implementing an Environmental Stewardship Program in the Yukon Department of Education.

The research for this report began in the fall of 2008, and was supported by an Environmental Stewardship Advisory Committee made up of representatives from the Yukon Departments of Education, Environment, and Energy, Mines and Resources as well as the Yukon Energy Solutions Centre.

Through the course of this project, many people provided information by phone and email, and in face to face meetings. Special thanks go to staff at the Calgary Board of Education, the B. C. Ministry of Education, the Ontario EcoSchools program, and the Maryland Green Schools program. In each jurisdiction, individuals who were passionate about education and environmental stewardship were eager to share their experiences and lessons learned.

Staff at Yukon and federal government departments, school administrators and teachers, the City of Whitehorse and members of the private sector also offered their time and knowledge.

For the most part, the work contained in this report stays at a fairly high level. Much more time could have been spent reviewing outstanding case studies and resources from around the world, and investigating in great detail the current practices in Yukon schools. The recommendations are not exhaustive, but are designed to support the implementation of an Environmental Stewardship framework that will continue to develop new ideas and approaches to improving stewardship practices over the long term.

## Executive Summary

Programs that integrate environmental stewardship and education range from recognition programs operated by outside organizations that celebrate the achievements of individual schools, to department wide initiatives that directly impact all aspects of the department's operations.

The Maryland Green Schools program is a partnership between the Maryland Association for Environmental and Outdoor Education and the private sector. The program established criteria for Green School certification, and manages the ongoing certification process. The program was fully implemented in 1999, and over 200 Maryland schools are now certified as Green Schools.

While the Maryland program is not actively involved in activities at the individual schools, the certification criteria illustrate the focus of the program. To become certified as a Maryland Green School, schools must demonstrate achievements in environmental curriculum and instruction, green school operations and maintenance, and community partnerships on environmental issues.

The Ontario EcoSchools program is a partnership between school boards in the province, the provincial government, and conservation organizations. The EcoSchool designation is achieved by meeting similar requirements in environmental curriculum and green school operations with a special focus on integrating classroom learning with the building operations. In only five years, over 500 Ontario schools have been certified as EcoSchools.

In addition to the certification program, Ontario EcoSchools has also developed Green School Guides on waste minimization, energy conservation, and school ground greening. Curriculum resources for Grades 9 to 12 Science, Grade 10 Civics, and Grade 11 and 12 Geography that closely match the Green School Guides provide support for teachers while integrating the curriculum with the building operations.

Both the Calgary Board of Education (CBE) and the B.C. Ministry of Education have organization wide initiatives that address all aspects of the education system.

In Calgary, the CBE has a seven person EcoTeam working on environmental stewardship in all facets of their operations including energy, waste, curriculum, community partnerships and environmental management systems. The board has developed a comprehensive framework to guide implementation of their program.

The CBE has identified key requirements of a successful ES program including increasing environmental literacy in the organization, the integration of curriculum, facilities and community ES initiatives, and ensuring all ES activities have clear measureable outcomes. The CBE is partnering with the City of Calgary to use the Ecological Footprint metric to provide qualitative and quantitative measurements to inform and evaluate their initiatives.

In British Columbia, the Green Schools program is operated by the Ministry of Education (MOE) and extends to every school in the province. The Green School program developed from the climate change commitments made in the 2007 Throne Speech. Every B.C. Government Ministry and Agency is required to develop climate action plans resulting in over 180 plans across government. While the responsibilities

for implementing the Climate Action Plan extend across the Ministry, staff in the MOE Climate Change Unit provide leadership, expertise and coordination to the program.

The MOE focuses their activities in a number of area. These include supporting students in becoming more aware of environmental issues, as well as supporting teachers to include environmental concepts in their teaching. Enhancing school infrastructure and transportation to reduce greenhouse gas emissions, and developing more environmentally responsible school communities are also key objectives.

The Yukon Department of Education does not have a formal ES program. Despite this, there are numerous examples of good ES practices within the Yukon school system.

Most Yukon schools offer outdoor learning activities in the wonderful natural environments around their communities. Culture camps, bison hunts, and hiking, biking and canoeing trips are a few of the many activities that enhance the classroom instruction. The formal outdoor experiential learning programs offered at Wood Street Centre and several other schools in Whitehorse, and at St. Elias Community School in Haines Junction are great examples of integrating outdoor activities, environmental lessons and the school curriculum.

Almost every school has a recycling program, and over 60% of Yukon schools also have a composting program. These waste diversion programs are generally run by teachers and students on a volunteer basis. School custodial staff use environmentally friendly cleaning products that are EcoLogo certified, and the paint used in schools has extremely low levels of volatile organic compounds.

Yukon schools vary widely in the amount of resources they consume. Oil, propane and electricity data was combined to calculate the average amount of energy used per square foot in every school. Energy performance in the schools ranged from 78.2 Megajoules/$ft^2$ at St Elias Community School in Haines Junction to 174.6 Megajoules/$ft^2$ at Eliza Van Bibber School in Pelly Crossing.

While extreme climate conditions in the Yukon mean that heating and lighting costs will obviously be higher here than in southern jurisdictions, the variation between the best performing schools and the worst performing schools suggest there is significant room for improvement. At current prices, the Department of Education spends well over $4 million on energy each year, so the financial incentive to improve energy performance is significant as well.

Whitehorse is the only municipality in the Yukon that uses water meters for commercial and institutional buildings, and based on the available data, there is even more room for improvement in school water consumption.

The Collaborative for High Performance Schools (CHPS) suggests that an average school uses about 30 litres of water/student/day, while a water efficient school should use about 18 litres/student/day. In Whitehorse, Holy Family Elementary School beats the CHPS best case scenario and uses only 16 litres/student/day. However, only three other schools come close to the 30 litre average use. The rest

use more than double the amount of water an average school should use, and Grey Mountain Primary School uses a remarkable 287 litres/student/day.

Improvements can also be made to school transportation. School buses in the territory operate at about 57% capacity. While many communities operate only one route, ruling out possible route efficiencies, most buses have 72 seats resulting in many empty seats in smaller communities. In the Whitehorse area, 42 separate bus runs operate at about 61% capacity. While a number of the routes are near or at capacity, 20 of the 42 buses are less than 55% full.

The biggest challenges in implementing an environmental stewardship program in the Yukon education system are the gaps in specific policies and detailed building information, and the lack of a process for effectively integrating resource use data into the decision making process.

While there are many specific actions that will improve environmental stewardship in a tangible way in the short term, it is far more important to put in place the partnerships, processes and systems to ensure continuing and permanent progress. The movement to sustainability will take time and will eventually impact all aspects of the department.

To date, many of the positive environmental stewardship initiatives at the Department of Education have resulted from volunteers in Yukon schools and within the department that are passionate about the environment. While it is important to recognize and build on their work, it is also critical that the department dedicate staff to manage the change process. A comprehensive stewardship initiative cannot be implemented off the corner of someone's desk.

At the same time, a single person or even a team of people cannot operate in isolation. Everyone in the education system must participate in the program. Students, teachers, and staff at Yukon schools and at the Education offices need to understand the importance of environmental stewardship, the goals of the program, and their role in it. Increasing the general environmental literacy of everyone within the education system is critical. Some staff will also need specific training to support their job responsibilities within an ES framework.

To encourage participation in the ES initiative and celebrate excellence in Yukon schools, a two level Yukon Green Schools recognition program should be developed. A basic Yukon Green School designation would recognize participation in environmental stewardship in the school through the establishment of a school Green Team, a commitment to participate in the monitoring of energy, water and waste in the building, and a commitment to offering environmental education throughout the curriculum.

Completing specific actions related to energy and water conservation, waste reduction, school ground greening, community partnerships, and outdoor learning opportunities would result in Green School designation at the higher level.

The Department of Education has many significant partners in the education system that should be engaged early in the process. The early development of partnerships will add value to the process, and

build support for the program. These partners include Yukon First Nations, school administrators and teachers, school councils, and of course, Yukon students.

Another level of partnership is between key departments in the Yukon Government. The majority of activities related to school buildings will be implemented by the Yukon Department of Highways and Public Works. The Department of Finance must support the capital investments required to realize long term environmental and economic benefits, and the technical expertise of the Energy Solutions Centre will be important. High level engagement of these departments is essential.

The collection and use of data must be improved. There is a lack of information on the amount of waste being produced and diverted, and the available data on water and energy use is not being effectively incorporated into operations, maintenance and capital decisions. The Education Department should establish accurate baseline information on energy, water, and waste for each building they operate. After completing energy and water audits for each building, reduction targets should be set, and a system to monitor and report ongoing use should be established.

The capital planning and budgeting process should also be changed. Governments typically make large capital decisions without full consideration of the implications of their decisions over the full lifespan of the building. Green buildings are sometime seen as a luxury that cost significantly more than traditional construction. In fact, small increases of 2% – 3% in the initial cost of construction can lead to substantial savings in operations and maintenance for many years.

Life cycle assessment is the process of considering the total cost of ownership of a capital asset – the initial planning, design and construction, operations, maintenance and repair, required replacement of components, and the eventual disposal costs of the asset. Using life cycle assessment in all significant capital decisions will ensure that the right financial and environmental decisions are made.

Identifying dedicated resources to support the program, building strong partnerships inside and outside of government, and increasing the environmental literacy of students and staff will create conditions conducive to a successful environmental stewardship program.

Establishing accurate baseline data, setting reduction targets, and monitoring and analysing the results of the actions taken, combined with implementation of full life cycle assessment in capital planning and budgeting will provide many of the tools required.

Actively engaging students in the process and integrating environmental learning throughout the curriculum will ensure that in the future, environmental stewardship will become the normal way of doing things, rather than the exception.

## Education and Environmental Stewardship Case Studies

Schools, school boards, and Departments of Education across Canada and indeed around the world are making a strong commitment to environmental stewardship (ES). Some jurisdictions are further along than others, and within jurisdictions, some early adopters are clearly leading the way.

An examination of all relevant case studies is beyond the scope of this report. Rather, several case studies are presented that illustrate different approaches to ES. While the specific activities of the different jurisdictions are relevant, it is also critical to understand the structures, reporting relationships, policies and procedures that allow these programs to succeed.

## Maryland Green Schools and Centres

The Green School program developed by the Maryland Association for Environmental & Outdoor Education (MAEOE) was initiated in 1997. Schools participating in this voluntary program are required to go through a detailed application process to achieve Green School status. Currently, there are about 200 recognized Green Schools of the 1400 schools in the State of Maryland. Green School recognition lasts four years, at which time the school must apply for recertification to maintain its status.

In addition to the green school designation, the MAEOE offers a Green "Centre" designation. This recognizes environmental education centers, outdoor schools, and nature centers that support Maryland green schools while sharing similar environmental goals as the schools.

### Organization

The two year process to develop the program was supported by the MAEOE as well as the Maryland Ministries of Natural Resources, Education, and Environment. This time was spent developing the criteria for Green School certification and the recognition process. The first Maryland Green School was recognized in 1999.

After establishing the criteria for Green School/Centre membership, the primary role of the MAEOE Green School program has been to manage the application and recertification process. They also conduct research and provide resources for Green Schools and Centres, as well as organize an annual conference.

The program is currently operated by one part time staff position that is funded by the Ministry of Natural Resources, outdoor equipment retailer REI, and energy giant Constellation Energy. The Maryland Ministry of Education also provides in-kind support. Regional contacts for the program at schools and boards in counties throughout the state operate on a volunteer basis.

### Focus

The Maryland Green School program focuses on three broad areas, each comprised of several criteria that schools must meet to achieve Green School designation.

The three focus areas are:

- Curriculum and Instruction
- Operation, Design and Maintenance of School Buildings and Grounds
- School Community

### Activities

Although the MAEOE program does not engage in significant activities beyond operating the recognition program, the Green School criteria illustrate the activities that Maryland Green Schools are undertaking.

**Curriculum and Instruction** (schools must meet all three criteria)

- **Environmental Issue Instruction**
  Students have opportunities at all grade levels and across disciplines to study environmental issues.
- **Professional Development**
  School staff members are involved in professional development that enhances environmental awareness.
- **Celebration**
  The school recognizes and celebrates staff and student achievement in environmental best management practices.

**Operation, Design and Maintenance of School Buildings and Grounds** (schools must meet at least four of seven criteria)

- **Water Conservation and/or Water Pollution Prevention**
  The school practices water conservation and /or water pollution prevention.
- **Energy Conservation**
  The school practices energy conservation.
- **Solid Waste Reduction**
  The school practices solid waste reduction, reuse and/or recycling.
- **Habitat Restoration**
  The school maintains, enhances or implements natural habitat restoration areas on the school grounds or in the community.
- **Building Structures for Learning About the Environment**
  The school implements structures or green building components that enhance environmental learning or improve habitat.

- **Responsible Transportation**
  The school promotes and provides responsible transportation options such as carpooling, walking, biking and public transportation.
- **Healthy School Environment** School buildings and grounds are managed to ensure clean air, clean water and a healthy learning environment.

**School Community** (schools must meet at least one of the criteria)

- **Community Partners in the Local Community**
  The school encourages partnerships that address environmental issues in the local community.
- **Community Partners at the School**
  Community partners encourage and support the development and implementation of solutions to environmental issues at the school.

The Green Centre designation follows a similar set of objectives and requirements. Green Centres must:

- Support area schools in achieving Green School status.
- Meet all seven of the criteria under the Green Schools objective related to the building and grounds.
- Support community learning on environmental issues.

## Ontario EcoSchools

The Ontario EcoSchools program was started in 2002 and was based in large part on a program developed by the Toronto District School Board. EcoSchools was developed by a partnership of school boards and other education stakeholders and is a voluntary program for schools. EcoSchools has created a two part process that starts with simple participation and use of EcoSchool resources and evolves into EcoSchool certification.

In 2003/04, 13 schools in a single school board were certified as EcoSchools. By 2007/08, 540 schools and education sites representing 24 school boards and 2 conservation authorities were certified. It is also estimated that up to 800 additional schools are using the resources provided by EcoSchools but have not yet entered the certification phase. In total, the Province of Ontario has over 5000 schools in 72 school boards.

## Organization

The program is a partnership between a number of school boards, conservation organizations, the City of Toronto, the Government of Ontario and York University. EcoSchools operates under the direction of a steering committee made up of representatives of the partners.

Three staff members – a Program Coordinator, an Assistant Program Coordinator and an Administrative Assistant – operate the program with the majority of funding coming from the Ontario Ministry of

Education. Many of the existing resources that support Ontario EcoSchools were developed with support from the federal government and the Ontario Ministries of Energy and Environment.

### Focus

Ontario EcoSchools has developed primary goals which they describe as the four "pillars" of the program. These are:

- Waste minimization
- Energy conservation
- School ground greening
- Ecological literacy

They have also established 4 "purposes" that more directly reflect the activities of the staff of the organization:

- Provide teachers with environmental education resource units for elementary and secondary grades based on the Ontario Curriculum.
- Provide guides that promote taking individual action to reduce greenhouse gas emissions.
- Align what is taught in classrooms with school operations.
- Save money and reduce the impact on the environment (e.g., conserve energy and minimize waste) at both the Board and individual school levels.

### Activities

The initial activities of the Ontario EcoSchool program between 2002 and 2004 were funded in large part by a federal grant. During this time, the program design, the green school guides and the curriculum resources were put in place. The Toronto District School Board EcoSchool program began operating in 2000, and resources from their efforts were generously donated. Most of the work in adapting or developing the resources was done by contractors.

A Five-Step process for schools implementing the EcoSchools program was developed. The steps are:

- Establish an EcoTeam.
- Conduct an EcoReview.
- Develop an Action Plan.
- Implement the Action Plan.
- Monitor and Evaluate Progress.

EcoSchool certification criteria were developed that allow Ontario schools to become certified EcoSchools at the bronze, silver or gold levels. Points to achieve certification are available in:

- Teamwork and Leadership
- Energy Conservation
- Waste Minimization
- School Ground Greening
- Curriculum
- Environmental Stewardship & the School Community

The EcoSchools program also developed guides to help schools green their operations in three key areas:

- Waste Minimization
- Energy Conservation
- Schoolground Greening

Each guide is a comprehensive resource to help schools achieve their green school goals. Guide elements include:

- Information on the EcoSchools program, resources and the Five-Step Process
- Best Practices and guidelines
- Information on conducting an EcoReview
- Information on developing an Action Plan
- Toolkit of activities

Curriculum resources were developed at the elementary and secondary level, based on Ministry of Education mandated Learning Expectations. These resources closely match the green school guides to help Ontario EcoSchools meet their goal of aligning what is taught in classrooms with school operations.

Elementary curriculum resources in Energy Conservation and Waste Minimization provide "big ecological ideas" that can be taught in each grade, provide resources for teachers and link the concepts to existing Ministry of Education Learning Expectations in Science and Technology.

A suite of curriculum resources for the secondary level provide similar information for increasing ecological literacy in climate change. These guides cover Learning Expectations in:

- Grade 9 Science
- Grade 10 Civics
- Grade 10 Science
- Grade 11 & 12 Science
- Grade 11 & 12 Geography

Multi Media presentations to support the climate change resources have also been created.

The current staffing level at the Ontario EcoSchools program allow for reviewing and updating these resources when necessary, as well as updating the certification process annually. Promoting the program and overseeing the certification process are the prime responsibilities of the staff.

## Calgary Board of Education - EcoStewardship

The Calgary Board of Education (CBE) has long been a leader in environmental education and energy management. The board has operated an energy management office for about 30 years, and has offered outdoor and environmental education programs since the 1970's. In an effort to build on their success in these areas, the CBE established an EcoTeam in 2006 to provide a focused and strategic approach to these issues.

The CBE believed that the best way to ensure that ecological imperatives were entrenched within its decision making processes was to increase environmental literacy throughout the system. This included board employees, teachers, administration and staff at individual schools, as well as associated community members and groups.

### Organization

The EcoTeam is made up of seven dedicated staff members employed by the CBE. These positions are:

- **Environmental Projects Coordinator**
  Responsible for new technologies and ideas to promote green building management and increase energy efficiency and conservation in CBE's facilities.

- **Environmental Management Systems Coordinator**
  Leads the development and implementation of an Environmental Management System with the goal of ISO 14001 certification.

- **Community Projects Coordinator**
  Facilitates partnerships and relationships within the CBE and between the CBE and the community with respect to operational environmental literacy, energy efficiency and sustainability.

- **Curriculum Consultant**
  Provides strategic leadership to curriculum initiatives that advance environmental stewardship.

- **Waste & Recycling Coordinator**
  Provides technical, operational and advisory services related to waste reduction, recycling, diversion and management.

- **Energy Coordinator**
  Works with Facility Operators and Maintenance to reduce energy consumption through energy retrofits, recommending building control systems, and other energy reduction initiatives.

- **Energy Advisor**
  Works with Facility Operators and Maintenance to track energy usage in schools and work to reduce energy consumption through energy retrofits, analyzing building control systems, and other energy reduction initiatives.

### Focus

The CBE invested significant time and effort in establishing a comprehensive Environmental Stewardship Framework as the first task for its EcoTeam. This framework includes a vision for the CBE and a mission statement and guiding principles for the EcoTeam, as well as strategic outcomes and individual outcomes to focus the activities.

The vision established for the EcoStewardship program at the CBE is broad and far reaching:

> *"The Calgary Board of Education is a model of local and global environmental stewardship."*

The CBE believes that to be successful in advancing environmental and sustainability imperatives into the Board operations, they needed to increase the environmental literacy of all members of the greater education community. The mission of the EcoTeam is defined as:

> *The Education*Energy*Environment team provides leadership to advance operational environmental literacy through strategic facility, curricular and community initiatives."*

The **eleven guiding principles** that help define the role of the EcoTeam are:

**Operational environmental literacy**
Environmental literacy is integrated to promote decision making and environmental stewardship.

**Triad-leadership framework**
Integrate curriculum, facility and community aspects to implement and manage initiatives.

**Strategic and sustainable initiatives**
Initiatives will be comprehensive, coordinated and reflect system perspectives.

**Measureable outcomes**
Initiatives will have clear measureable outcomes that reflect social, economic and environmental perspectives.

**Inclusive and transparent**
Collaborate through networks and partnerships with internal and external organizations.

**Coaching**
Support and empower leaders.

**Celebrate success**
Progress will be recognized and celebrated.

**Natural world experiences**
Quality education experiences in the natural world will develop ecological respect.

**Community engagement**
Share resources and success with other organizations and the general public.

**Aligned and consistent**
Initiatives are consistent with the core values of the CBE.

**Acknowledge and build on the CBE's environmental legacy and instill a new standard of best practice.**

### Activities

**Strategic outcomes**

Based on the vision of the CBE, four strategic outcomes comprise the primary objectives of the ES framework:

- Environmental literacy is integral to the culture of the Calgary Board of Education.
- The Calgary Board of Education co-operates with external initiatives that support advancing environmental stewardship.
- The Calgary Board of Education provides strategic leadership, resources, and programs to schools and associated communities that advance environmental stewardship.
- The Calgary Board of Education is guided by its ecological footprint indicators in efforts to advance environmental stewardship.

The activities the CBE EcoTeam will undertake to advance these strategic outcomes are contained in a five year implementation plan. Between three and six individual outcomes were developed for each strategic outcome and numerous implementation initiatives were described for the individual outcomes. The initiatives were divided into short term (1-2 years), medium term (2-4 years), and long term (3-5 years).

While the specific implementation initiatives are varied, they tend to be fairly evenly split between initiatives that build capacity within the CBE to increase EcoStewardship into the future, and projects that will have a more immediate short term impact on sustainability.

Projects currently underway or recently completed include:

**Facilities**

- Installation of low flow fixtures, occupancy sensors for lights and more efficient light bulbs in selected schools.
- Night setbacks for heating systems in selected schools.
- Installation of Building Management Systems in 90 schools.
- Completed energy audits of eight schools and began performance contract retrofits.
- Completed Waste Assessment Project and Waste Management Implementation Plan.
- Coordinated Book Recycling Project.
- Created partnership with Enmax to promote renewable energy demonstration projects at schools.

**Curriculum**

- Operated *Destination Conservation* in 40 schools.
- Supported *Learning for a Sustainable Future* youth forum.
- Conducted Professional Development Programs at schools to support environment across the curriculum planning.

**Community**

- Membership in ImagineCALGARY partnership.
- Linked CBE operational goals and targets to ImagineCALGARY targets.
- Worked with the City of Calgary and the University of Calgary to develop an online footprint calculator for schools.
- Member of Environmental Advisory Committee to City Council.

To meet its guiding principle of ensuring that initiatives will have clear measureable outcomes that reflect social, economic and environmental perspectives, the CBE is working with the City of Calgary to use the Ecological Footprint metric to guide their actions and measure their success.

The CBE EcoTeam is also currently working on an EcoSites program that will be similar to the Ontario EcoSchools and Maryland Green Schools designation. Of the 215 schools in the CBE system, it is estimated that about 50% are participating in the EcoStewardship program and that 90% are doing some activities that contribute to increased sustainability.

## BC Green Schools

As part of its commitment to address climate change outlined in the 2007 Throne Speech, the BC government required every government Ministry and Agency to develop Climate Action Plans. In total, over 180 individual Climate Action Plans were developed across the government. The Green Schools program in British Columbia is a Ministry wide effort that includes environmental education and sustainable infrastructure and operations.

The system includes over 1700 buildings and 550,000 students, and the goal of the BC Climate Action Plan is for all government operations to be carbon neutral by 2010.

### Organization

The BC Ministry of Education's Green School programs operate from its Climate Action Unit which was established in 2007. The unit resides within the Governance and Accountability division.

The Climate Change Unit Director supervises a Sustainability Programs Unit with a Manager and a Coordinator that is focused on environmental education, as well as a Sustainable Infrastruc ıre Unit with a Manager focused on school buildings and operations. The Green Schools initiatives are not restricted to the Climate Action Unit as they impact programs and projects across the Ministry. The

responsibility for implementing Green School programs extends throughout the Ministry of Education and the Climate Action Unit is responsible for providing a focus and specific expertise to these programs.

### Focus

The BC Green School program is comprehensive and extends to all activities of the Ministry of Education. They have identified four themes that focus their activities:

- Supporting students in becoming more aware of environmental issues, increase their ability to become local leaders, and improve their sustainable practices in everyday life.
- Supporting teachers to use environmental sustainability ideas and concepts in their teaching.
- Developing school communities to be more effective, efficient and environmentally responsible.
- Enhancing school infrastructure and transportation systems to reduce provincial greenhouse emissions.

### Activities

The work plan for the BC Green Schools groups their initiatives into four categories.

**Internal Planning and Leadership**

Activities focused on increasing the internal capacity of the Ministry to manage sustainability issues include:

- Establishing the Green Schools Unit which was completed in 2007.
- Developing a web based sustainability planning tool. The Ministry has begun to implement the "See It" web tool from Visible Strategies. This is the same tool adopted by the City of Whitehorse for its sustainability planning process.
- Creating a Green Schools Network. Linking BC schools involved in green initiatives is expected to foster collaboration and sharing of best practices. It will also help the Ministry learn more about green initiatives happening in schools.
- Hosting a Sustainable Schools Conference. This event was held in February 2009 and focuses on the coordination of school-based sustainability planning between operations and programs.

**Internal Ministry Projects**

A large list of internal Ministry projects highlight relatively easy projects that offer quick wins for the program. They include:

- Installation of occupancy sensors on lights, low flow washroom fixtures, composting and recycling stations, "no touch" recycled towel dispensers that encourage less waste, and the purchase of dishes, cutlery and glasses for Ministry offices. All of these initiatives support conservation of resources.

- Secure bicycle storage, lockers and showers at Ministry buildings to encourage less car use by Ministry staff.

Also included are initiatives such as energy audits of the two main Ministry buildings, initiatives to reduce Ministry travel, and increasing staff awareness and knowledge around climate change and sustainability issues.

**Sustainable Operations and Infrastructure**

These activities are focused on making school system operations and infrastructure more sustainable. Activities include:

- Establishing High Performance Building Standards. These standards will include design and procurement policies and LEED Gold Certification or equivalent. The policy on High Performance Building Standards is currently undergoing a final review.

- Establishing a District Sustainable Operations Committee with representatives of school boards, the Ministry of Education and School Plant Operators Association (SPOA). The first meeting was held in February 2008 with 11 school districts, Ministry staff, BC Hydro and the SPOA attending.

- Decreasing GHG emissions from school buses. The first hybrid school bus in Canada was purchased in January 2008, and four more have been ordered. 72% of the Ministry's 767 school buses have had new catalytic converters installed with all remaining buses expected to be retrofitted by 2009/10.

**Sustainable Education Programs and Initiatives**

Projects supporting sustainable education are numerous. Initiatives include:

- Development of *Environmental Learning and Experience in Classroom: An Interdisciplinary Guide for Teachers*. A resource to support teachers to introduce environmental curriculum into their day to day teaching, this document was completed in October 2007.

- A new *Science 10* Integrated Resource Package (IRP) with Prescribed Learning Outcomes (PLO) that require teachers to address the issue of climate change. Implemented in September 2008.

- A new *Sustainable Resources 11 & 12* course with PLOs that focus on sustainability and environmental impacts of natural resources. Completed in September 2008.

- A teachers' resource for teaching students about climate change. Working with the Ministry of Environment and Wild BC, the resource for elementary teachers was completed in September 2008, and the secondary resource is scheduled for completion in February 2009.

- Distribution of Green School Eco-Kits. 1150 kits are being distributed to schools across the province.

- Completion of Curriculum Maps for all grades and courses taught as part of the BC curriculum. This document maps the learning outcomes that exist in K-12 curricula with strong links to sustainability and environmental concepts in an effort to save teachers time. The document was released in December.

## Other Best Practices and Resources

Many best practices and other resources that support green school operations and environmental curriculum are available. Some of these are briefly described below.

### Green School Buildings

**Advanced School Design Guide for K-12 School Buildings**

This comprehensive guide was developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) in partnership with:

- The American Institute of Architects
- Illuminating Engineering Society of North America
- U.S. Green Building Council
- U.S. Department of Energy

It recommends design guidelines for building envelopes, lighting, HVAC and water heating to achieve a 30% reduction in energy use. Detailed, prescriptive guidelines for each climate zone in the United States up to Zone 8 (Alaska and Yukon) are included. 10 individual case studies are also presented, although none of the schools highlighted are in Zone 8.

**Energy Design Guidelines for High Performance Schools - Arctic and Subarctic Climates**

Published by the US Department of Energy, this guide provides recommendations and information on a wide range of building components. These include:

- Site Design
- Daylighting and Windows
- Energy Efficient Building Shell
- Lighting and Electrical Systems
- Mechanical and Ventilation Systems
- Renewable Energy Systems
- Water Conservation
- Recycling Systems and Waste Management
- Transportation
- Resource Efficient Building Products

While the information and recommendations do cover a wide variety of design considerations, they are not prescriptive or specific. This guide would be best used as a toolkit of ideas for building more sustainable northern schools.

**LEED for Schools**

LEED (Leadership in Energy and Environmental Design) is a well known program that has been developed by the US Green Building Council (USGBC). In Canada, the Canada Green Building Council (CaGBC) adapts the US guidelines to offer LEED certification for Canadian buildings. While the USGBC has developed a specific LEED for Schools program, this has not yet been adopted in Canada.

The LEED for Schools is based on the LEED for New Construction (LEED NC) with several new credits and prerequisites as well as a number of modifications, additions and deletions to existing credits.

As with all LEED programs, certification at various levels – Certified, Silver, Gold and Platinum – is based on a point system. Points are earned by meeting prerequisites and optional credits in six categories:

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation and Design Process

The LEED program offers comprehensive guidelines covering virtually all important elements of sustainable design and construction. The different certification levels as well as the "pick and choose" point system offer a flexible approach to building more sustainable school buildings, and the certification process provides outside verification that sustainable standards are being met.

**Collaborative for High Performance Schools**

The Collaborative for High Performance Schools (CHPS) is a California based organization formed by a coalition of government agencies, public utilities, and Non Governmental Organizations (NGOs). The program has spread to several other states, although the highest number of CHPS qualified schools is in California. CHPS has designed a rating system very similar to LEED that is focused on building green schools. The CHPS also provides best practices guides for:

- Planning
- Design
- Building Commissioning
- Maintenance and Operations

In addition to guidelines on maintaining the building's hard infrastructure, the maintenance and operations best practices includes information on:

- Equipment Procurement
- Recycling and Waste Management
- Cleaning Practices and Products
- Landscaping
- Snow Management

## Curriculum

**Green Street**

Green Street is a project funded by the W. McConnell Family Foundation with secretariat services provided by the Centrale des Syndicats du Québec for the French language program, and by the Canadian Teacher's Federation for the English language program.

Green Street provides a searchable database that allows users to locate environmental education resources matched by jurisdiction, subject area, and grade level. Subject areas covered include:

- Science
- Social Studies
- Geography
- Practical and Applied Arts
- Physical Education/Outdoor Education
- Language
- Math

Each resource includes the curriculum connections and expectations met, although these are not tied to specific Prescribed Learning Outcomes from the BC curriculum. The resources available are primarily from Canadian Environmental NGOs, and are available free of charge or for a nominal fee.

**Pembina Institute – GreenLearning**

The Pembina Foundation for Environmental Research and Education is an Alberta based environmental NGO. Their GreenLearning program provides complete themed curriculum resources originally designed based on the Alberta curriculum. Curriculum links to BC and Ontario have been developed and links to other provincial curriculum are also underway.

Resources currently available include:

- Science 5 - Electricity All Around Us
- Science 7 - Real World Ecosystems
- Science 24 - Real World Energy
- Social Studies 20 – Sustainable Futures for a Small Planet

Each unit includes a Teacher User Guide, up to 30 or more distinct student activities with a teacher plan, assignments, PowerPoint presentations, backgrounders and assessment tools for each activity. The direct links to existing curriculum and the comprehensive teacher resources make these programs a useful model for environmental education resources.

## Current Environmental Stewardship Practices

## in the Yukon Department of Education

Although there is currently no organized environmental stewardship program in the Yukon Education system, a review of current practices reveals many positive initiatives, as well as areas that offer potential for improvement.

Practices in school operations and maintenance, resource use, environmental education in and out of the classroom, and transportation were surveyed. The review was not exhaustive, but still highlights many positive buildings blocks for an Environmental Stewardship program, reveals practices that can be improved upon, and helps to identify areas that will require more study.

### School Operations and Maintenance

Most of the operations and maintenance of schools in the Yukon are done by the Department of Highways and Public Works (HPW). The department either carries out or supervises ongoing capital maintenance projects, grounds maintenance, and regular cleaning of school buildings.

#### School Cleaning

The vast majority of cleaning within schools is done using a product called "Green Unikleen." Unikleen can be used for almost all cleaning activities within the school. This water based, multipurpose cleanser is supplied by IPAX Cleanogel Inc. Automatic dispensers dilute the Unikleen with water to the appropriate levels for various cleaning purposes. IPAX markets the product as being:

- Non-Toxic
- Non-Corrosive
- Non-Allergenic
- Non-Hazardous
- Non-Caustic
- 100% Biodegradable
- No Carcinogenic Materials
- No Volatile Organic Compounds (VOCs)

While many products claim to be environmentally friendly, Unikleen's claims are backed up under regulatory guidelines and by independent third party certification. Under Canada's Workplace Hazardous Materials Information System (WHMIS), and the U.S Occupational Health and Safety Administration (OSHA), the cleaner is considered non-hazardous. Unikleen contains no:

- Butyls
- Acids
- Alkali
- Glycol Ethers
- Caustics
- Phosphates

Green Unikleen is EcoLogo certified. The EcoLogo program was established by Environment Canada in 1988, and is currently the largest environmental standard and certification program in North America. Unikleen is also certified under the American Green Seal Environmental Standard for Industrial and Institutional Cleaners. Unikleen is the second certified environmental cleaner that has been used in Yukon schools. Custodial staff were not satisfied with the performance of the previous cleaner, but anecdotal evidence suggests that Unikleen is more effective.

In a very few instances, stronger disinfectants such as bleach are used when the situation demands it. Cleaning blood is one of the times that the regular environmental certified cleaners are not used.

### School Painting

HPW is currently using a General Paint Corporation product in Yukon Schools. Z-Coat is a latex (water based) paint marketed by General Paints as being environmentally friendly, and is listed as emitting no Volatile Organic Compounds (VOCs).

There is actually no clear standard for VOC levels in paints and the description of paint as "no" or "zero" VOC usually represents very low levels (under 5 gm/litre) of VOCs, as opposed to absolutely no VOCs. The General Paint contains 5 gm/litre of VOCs according to the Material Data Safety Sheet (MDSS) provided by the manufacturer. It is estimated that the tinting typically added to paint bases will add another 5 gm/litre VOCs for a total of 10 gm/litre by the time this paint is applied to school walls.

To put that in perspective, some products sold as "low VOC" paints just meet the US Environmental Protection Agency (EPA) standard of less than 250 gm/litre, while some low VOC paints meet the Green Seal standard of less than 50gm/litre.

The Z-Coat from General Paint does contain one substance listed as a "hazardous ingredient." Titanium Dioxide is a naturally occurring mineral used as a pigment in a wide range of products including paints, plastics, papers, inks, food colouring, toothpastes and in cosmetic and skin care products. The Canadian Centre for Occupational Health and Safety estimates that titanium dioxide makes up about 70% of the total production volume of pigments manufactured worldwide. (Canadian Centre for Occupational Health and Safety, 2006)

There is some disagreement as to potential health risks associated with titanium dioxide. It has generally been considered non toxic for many years, as its use in such a wide range of products including food and skin care would suggest. The American Conference of Governmental Industrial Hygienists (ACGIH) says that titanium dioxide is "not classifiable as a human carcinogen" (Canadian Centre for Occupational Health and Safety, 2007). The US Food and Drug Administration (USFDA) allows for its ingestion, application to skin and considers it a safe substance for human health.

On the other hand, the International Agency for Research on Cancer (IARC) has recently classified titanium dioxide as an IARC Group 2B carcinogen – "possibly carcinogenic to humans" (International Agency for Research on Cancer, 2006). This classification represents substances for which there is limited or insufficient evidence of carcinogenicity in humans.

## Pesticide Use

Pest management in Yukon schools is currently provided by Orkin Pest Control. Orkin uses only one product on a regular basis. Contrac Blox is a rodenticide (containing bromadialone) that is used to monitor and control rodent activity on a monthly or semi-monthly basis. The product is only used in carefully controlled situations. Contrac Blox is secured inside a locking bait station and is only used in locked areas that are off limits to students such as locked boiler and mechanical rooms.

Several other insecticides are used as required. Drax (containing Boric Acid) and Maxforce (containing hydramethylnon) are both ant baits that are used only in areas off limits to students. Tempo (containing Cyfluthrin) and Dragnet (containing Permethrin) are residual insecticides that are applied as sprays.

The Environmental Programs Branch (EPB) of Environment Yukon approves the use of all pesticides as part of the pesticide application permit process, and any use of pesticides in Yukon schools must be reported to the EPB 48 hours prior to use. The EPB maintains a database which contains details of all pesticide use reported under pesticide permits.

Reported pesticide use in Department of Education buildings has gone up considerably in the last 5 years. From 2004 to 2006 there was less than one application/year on average. In 2007, there were 28 applications, and in 2008 there were 42 applications.

## School Grounds

There are a number of issues associated with grounds maintenance that can impact environmental stewardship. Irrigation, herbicide and pesticide use, and fertilizer use can all have negative impacts depending on their level of use. Machinery used to maintain the grounds typically use fossil fuels in engines which have relatively high levels of emissions.

Property Management Agency reports that no pesticides or herbicides are currently used on Yukon school grounds.

Fertilizers are regularly used, however, and are usually applied three times per year. Different fertilizer mixes are used to meet the different seasonal requirements. Typically, the fertilizer applied in the spring has high nitrogen content (24% nitrogen – 6% phosphorus – 6% potassium), the fertilizer used in the summer has an equal mix (15% nitrogen – 15% phosphorus – 15% potassium), and the final application in the fall is lower in nitrogen and higher in phosphorus and potassium (8% – 24% – 24%). Fertilizers are applied by various private contractors which makes it difficult to estimate the actual amount of fertilizer used on Yukon school properties.

Almost all schools have built in irrigation systems, some of which are automatic systems. The specific amount of water used for irrigation purposes is difficult to measure in most cases, as most Whitehorse schools use a single water meter for all uses, and schools outside Whitehorse are not able to track water use at all due to the lack of meters.

However, five schools in Whitehorse have separate water meters that give some idea of water use for irrigation purposes. École Émilie-Tremblay has a second water meter that measures irrigation, while F.H. Collins, Porter Creek, Vanier and Jack Hulland all have separate water meters for the sports fields at the schools. There are some issues with the information available on water use that may affect the accuracy of the data. These issues are outlined in the section on school water use and some of them can be applied to the data below. The data presented below reflects the meter readings for irrigation and field watering for the 2007 season. The data for 2008 is significantly lower, and probably reflects the fact that the high amount of precipitation in the summer of 2008 decreased the need for irrigation.

**Water Use for Irrigation at Selected Whitehorse Schools 2007**

| School | Litres |
|---|---|
| École Émilie-Tremblay Irrigation Meter | 3,610,000 |
| F.H. Collins Secondary School Field Meter | 2,410,744 |
| Jack Hulland Elementary School Field Meter | 500,000 |
| Vanier Catholic Secondary School Field Meter | 2,857,000 |
| Porter Creek Secondary School Field Meter | 3,891,000 |

## School Resource Use

Yukon schools probably represent the largest single resource user within Yukon Government operations. The Department of Education operates over 30 individual buildings in almost every community in the territory. In many communities, the school is the largest single building. Resource use in these buildings represents significant opportunities for conservation both for environmental and economic reasons.

### Water Use

As already noted, evaluating water use in school buildings is difficult for a number of reasons. A lack of water metering in smaller municipalities make it impossible to track water use at schools in these communities. At this time, water data is only available for Whitehorse schools.

With the exception of the five schools listed above, there is currently no way to separate internal water use which would generally consist of washroom use and cleaning, from water use for irrigating school grounds and playing fields. As well, the "bleeding" of school water fixtures during cold winter periods is required in some schools to prevent freezing of water and wastewater pipes.

Reviewing the bimonthly data and tracking water use spikes in January/February and March/April (bleeding) and July/August (irrigation) suggests that in several schools summer irrigation and winter bleeding have a significant impact on annual water use.

The Department of Education is aware of several examples of significant system leaks being responsible for large increases in water use for a period of time. It is likely that smaller leaks have gone unnoticed for longer periods of time which could significantly impact the data.

Some of the meter readings in the data that was available are clearly inaccurate. In these cases, the Department of Education has been able to work with the City of Whitehorse to use past water use to estimate and revise the water bill from the city. Accurate meter readings, however, are not available for these time periods. In other cases, the replacement of a water meter in the middle of a billing period renders the data useless.

Despite all the challenges in measuring and evaluating water use in Yukon schools, the data does provide some useful general information. The table below reveals large differences between water use in Whitehorse schools. Except where noted, the data is from 2008. Although the most recent data is most reflective of current use, in two cases, other years were used because of the lack of accurate 2008 data.

**Whitehorse School Water Use 2008**

| **School** | **Water Use/Student/Day** (based on actual number of school days) |
|---|---|
| Grey Mountain Primary School (2007) | 287 Litres |
| Vanier Catholic Secondary School | 156 Litres |
| Selkirk Elementary School | 146 Litres |
| F.H. Collins Secondary School | 144 Litres |
| Porter Creek Secondary School | 131 Litres |
| Christ the King Elementary School | 108 Litres |
| Wood Street Centre | 91 Litres |
| Elijah Smith Elementary School (2006) | 63 Litres |
| Jack Hulland Elementary School | 32 Litres |
| Takhini Elementary School | 29 Litres |
| École Émilie-Tremblay | 28 Litres |
| Holy Family Elementary School | 16 Litres |

*Whitehorse Elementary School not included due to lack of reliable data for any year.

Although the bleeding and irrigation issues will impact the numbers, it is possible to consider these numbers in some context. The Collaborative for High Performance Schools (CHPS) Best Practices

Manual suggests that a baseline design case for school water use is about 30 litres/student/day. It also suggests that best water conservation practices can result in a significantly lower water use of 18 litres/student/day. (Collaborative for High Performance Schools, 2006) These numbers do not include irrigation which is considered separately. The CHPS is based in California, so they do not consider water bleeding either.

Whitehorse schools obviously vary greatly in their use of water. Not all Whitehorse schools use bleeding in the winter, and some of the schools with the highest water use (Porter Creek, F.H. Collins, and Vanier) have separate meters for field irrigation.

Holy Family actually exceeds the CHPS guidelines for efficient water use. École Émilie-Tremblay, Takhini and Jack Hulland all perform near the baseline case. The rest of the schools in Whitehorse are more than double the baseline case, and more than triple the level considered efficient. Grey Mountain Primary uses almost 16 times the amount of water a water efficient school would.

### Energy Use

Thanks in large part to the Yukon Energy Solutions Centre, there is significant data available on energy use at Yukon schools. Energy use at all Yukon schools has been compiled for the last eight years.

As with the water use, there are significant variations between the schools. However, it is difficult to compare energy use between schools and even more difficult to compare energy use between Yukon schools and schools in southern jurisdictions. Some of the reasons for this are obvious. Heating and lighting demands are higher in the Yukon, and indeed these vary between Yukon schools themselves.

The total energy used during this time period clearly illustrates the potential that school energy conservation initiatives would have for the environment and the finances of the Yukon government. In the eight years from April 2000 until March 2008, buildings operated by the Yukon Department of Education consumed almost 84 million kilowatt hours (kWh) of electricity, just over 16.3 million litres of fuel oil, and just over 5.4 million litres of propane.

Costs for energy have obviously varied greatly over this time. Fossil fuel costs rose dramatically over the last few years before dropping in the last several months. It is anticipated that fuel costs will rise significantly again when the current economic crisis eases. Electrical rates have also varied and unlike residential customers, the government pays different rates depending on location. Also unlike residential customers, the government electricity rates drop the more electricity they use. Considering these variables, exact calculations of future energy costs and potential savings are complicated.

Current rates for electricity, propane and fuel oil put the annual energy cost for the Department of Education at over $4,000,000.

Many different variables contribute to the energy efficiency of a building. School layout, building orientation, insulation and air infiltration levels, windows, lighting fixtures and controls, and the efficiency of heating and ventilation equipment all impact the amount of energy required to operate

school buildings. The table below illustrates the average annual amount of electricity and fossil fuels required to run Yukon schools over the last eight years. The final column converts and combines all energy used into Megajoules/$Ft^2$ to provide an easy comparison of the various buildings.

## Average Annual Energy Use in Yukon Schools, April 2000 to March 2008

| School | Average Annual Electricity/$Ft^2$ (kWh) | Average Annual Propane-Oil $Ft^2$ (Litres) | Total Average Annual Energy Use/$Ft^2$ (megajoules) |
|---|---|---|---|
| Eliza Van Bibber School (Pelly Crossing) | 14.98 | 3.71 | 174.6 |
| F.H.Collins Secondary School | 10.79 | 3.27 | 159.8 |
| Robert Service School (Dawson City) | 12.49 | 2.87 | 155.7 |
| Jack Hulland Elementary School | 9.88 | 2.87 | 146.1 |
| Porter Creek Secondary School | 12.38 | 2.61 | 143.5 |
| Teslin School | 7.01 | 2.90 | 136.6 |
| Nelnah Bessie John School (Beaver Creek) | 9.02 | 2.69 | 135.8 |
| Vanier Catholic Secondary School | 10.58 | 2.38 | 127.6 |
| Christ the King Elementary School | 7.32 | 2.50 | 122.5 |
| Grey Mountain Primary School | 19.70 | 1.33 | 113.1 |
| Ross River School | 8.20 | 2.17 | 112.7 |
| Selkirk Elementary School | 7.38 | 2.23 | 112.4 |
| Del Van Gorder School (Faro) | 8.03 | 2.16 | 112.2 |
| Takhini Elementary School | 4.86 | 2.85 | 111.6 |
| Wood Street Centre | 5.44 | 2.33 | 109.2 |
| École Émilie Tremblay | 8.15 | 3.01 | 106.0 |
| Holy Family Elementary School | 14.72 | 2.05 | 105.5 |

| School | Average Annual Electricity/Ft² (kWh) | Average Annual Propane-Oil/Ft² (Litres) | Total Average Annual Energy Use/Ft² (megajoules) |
|---|---|---|---|
| Elijah Smith Elementary School | 9.87 | 2.55 | 100.9 |
| Golden Horn Elementary School | 5.50 | 3.14 | 99.8 |
| J.V. Clark School (Mayo)* | 23.86 | 0.18 | 92.7 |
| Chief Zzeh Gittlit School (Old Crow) | 4.61 | 1.97 | 92.4 |
| Kluane Lake School | 6.27 | 1.78 | 91.2 |
| Johnson Elementary School | 4.22 | 1.98 | 91.1 |
| Whitehorse Elementary School | 4.47 | 1.99 | 87.6 |
| Hidden Valley Elementary School | 6.37 | 2.42 | 84.8 |
| Ghùch Tlâ Community School (Carcross) | 5.18 | 1.62 | 80.8 |
| St Elias Community School (Haines Junction) | 6.07 | 1.46 | 78.2 |
| Watson Lake Secondary** | 6.63 | 0.52 | 44.4 |

*Data for J.V. Clark School is from 2002-2008.

**Watson Lake Secondary School uses mostly waste heat from the nearby Yukon Electrical Generator. Data does not include this energy source.

***New school in Carmacks not included due to lack of energy use history.

Some of the schools offer surprising energy efficiency numbers. It is natural to assume that older buildings are less energy efficient, while newer buildings are more energy efficient. Increased insulation, better windows, improved technology and modern design and construction methods should all lead to more efficient schools. However, this is not always the case.

The schools in Haines Junction, Destruction Bay, Johnson Elementary in Watson Lake, and Whitehorse Elementary all stand out as schools built primarily in the 50's, 60's and 70's that are among the most energy efficient. In contrast, schools like Eliza Van Bibber in Pelly Crossing and Porter Creek Secondary School built primarily in the 80's and 90's are two of the highest energy users per square foot.

While a detailed examination of each school would reveal the specific reasons for different energy use levels, it is safe to say that the poor performance of some of the newer schools in the system suggest that recent Yukon school design and construction (with the exception of the newest schools in Mayo and Carmacks) has not always effectively incorporated energy efficiency.

## Transportation

The Department of Education operates 50 school bus routes. 34 of these serve schools within the City of Whitehorse, and 4 more routes serve Golden Horn Elementary School just outside the city limits. Four of the routes in the Whitehorse area are covered twice for a total of 42 Whitehorse area runs, while 12 bus routes serve schools outside of the Whitehorse area. Many of the bus routes are long, with 22 of the routes being over 100 kilometres in length.

Almost all buses have a capacity of 72 passengers. The exceptions to this are one 66 passenger bus in Whitehorse, and a 20 passenger bus providing service to the school in Destruction Bay. The Department of Education currently has no influence over the size of buses in use.

Data supplied by the companies that provide contracted school bus services in the Yukon shows that the school bus fleet has a total of 5032 seats available per day for students, and operates at just over 57% capacity. The buses travel a total of 6,451 kilometres each school day.

The busing in the communities and the busing in Whitehorse should be considered separately. With only one (Teslin, Pelly, Mayo, Carmacks, Haines Junction, Destruction Bay) or two (Watson Lake, Dawson, Carcross) bus routes per community, there are fewer opportunities for efficiencies outside of Whitehorse.

### Yukon School Bus Routes in Communities Outside Whitehorse

| Bus route | Kilometres | Students | Seats | Occupancy Rate |
|---|---|---|---|---|
| Carcross 1 | 43 | 32 | 72 | 44.4% |
| Carcross 2 | 187 | 11 | 72 | 15.3% |
| Teslin | 97 | 26 | 72 | 36.1% |
| Pelly Crossing | 33 | 29 | 72 | 40.3% |
| Mayo | 236 | 28 | 72 | 38.9% |
| Dawson City 1 | 52 | 38 | 72 | 52.8% |
| Dawson City 2 | 180 | 51 | 72 | 70.8% |
| Watson Lake 1 | 69 | 39 | 72 | 54.2% |
| Watson Lake 2 | 145 | 39 | 72 | 54.2% |
| Carmacks | 55 | 51 | 72 | 70.8% |
| Haines Junction | 182 | 10 | 72 | 13.9% |
| Destruction Bay | 140 | 7 | 20 | 35.0% |

The bus routes in these communities operate at only 44.5% capacity, with 7 of the 12 buses running with less than half of the seats occupied. 2 of the 3 communities with two bus routes operate each of them at over 50% capacity, while both Carcross routes operate below 50% capacity.

## Whitehorse Area School Bus Routes

| Bus Route | Kilometres | Students | Seats | Occupancy Rate |
|---|---|---|---|---|
| 1 | 161 | 39 | 72 | 54.2% |
| 2 | 108 | 56 | 72 | 77.8% |
| 3 | 295 | 26 | 72 | 36.1% |
| 4 | 234 | 27 | 66 | 40.9% |
| 5 | 148 | 49 | 72 | 68.1% |
| 6 | 136 | 49 | 72 | 68.1% |
| 7 | 175 | 23 | 72 | 31.9% |
| 8a | 58 | 38 | 72 | 52.8% |
| 8b | 58 | 31 | 72 | 43.1% |
| 9 | 282 | 35 | 72 | 48.6% |
| 10 | 63 | 49 | 72 | 68.1% |
| 11 | 89 | 70 | 72 | 97.2% |
| 12 | 263 | 28 | 72 | 38.9% |
| 13 | 68 | 50 | 72 | 69.4% |
| 14a | 111 | 41 | 72 | 56.9% |
| 14b | 111 | 38 | 72 | 52.8% |
| 15 | 80 | 39 | 72 | 54.2% |
| 16 | 67 | 72 | 72 | 100% |
| 17 | 83 | 58 | 72 | 80.6% |
| 18 | 87 | 72 | 72 | 100% |
| 19a | 65 | 32 | 72 | 44.4% |
| 19b | 65 | 37 | 72 | 51.4% |
| 20 | 34 | 48 | 72 | 66.7% |
| 21 | 81 | 50 | 72 | 69.4% |
| 22 | 155 | 46 | 72 | 63.9% |
| 23 | 188 | 38 | 72 | 52.8% |
| 24 | 33 | 59 | 72 | 81.9% |
| 25 | 83 | 22 | 72 | 30.6% |
| 26 | 84 | 72 | 72 | 100% |
| 27 | 79 | 31 | 72 | 43.1% |
| 28 | 42 | 21 | 72 | 29.2% |
| 29 | 93 | 71 | 72 | 98.6% |
| 30 | 84 | 66 | 72 | 91.7% |
| 31a | 57 | 12 | 72 | 16.7% |

| Bus Route | Kilometres | Students | Seats | Occupancy Rate |
|---|---|---|---|---|
| 31b | 57 | 64 | 72 | 88.9% |
| 32 | 57 | 43 | 72 | 59.7% |
| 33 | 68 | 58 | 72 | 80.6% |
| 34 | 88 | 55 | 72 | 76.4% |
| Golden Horn 1 | 146 | 32 | 72 | 44.4% |
| Golden Horn 2 | 259 | 26 | 72 | 36.1% |
| Golden Horn 3 | 389 | 38 | 72 | 52.8% |
| Golden Horn 4 | 148 | 32 | 72 | 44.4% |

The Whitehorse school buses are generally fuller than those in the other communities. 9 of the routes are operating above 80% capacity. However, in total, they still run at only about 61% capacity, and 14 of the bus routes run below 50% capacity. Of the four routes that are driven twice, two of them (8, 19) would still run at less than 100% capacity if they were combined.

There has not been a recent review of Whitehorse school bus routes. For the most part, the existing routes have been developed on an ad hoc basis over the years, rather than being guided by overarching school bus policies. The Department of Education does not currently have the capacity to map their bus routes, further hindering any future planning efforts.

While the number of bus routes with a low occupancy rate would suggest that route changes could easily bring about system efficiencies, the various education programs offered in different Whitehorse schools, combined with the relatively small school size do offer some challenges.

### Purchasing

The Department of Education purchases hundreds of different items on a regular basis. These range from consumables such as paper and other office supplies to longer lasting items such as school desks. Most of the items purchased come through Supply Services in the Department of Highways and Public Works.

Supply Services is currently developing a Green Procurement Policy to be used government wide as part of the Yukon Climate Change Action Plan.

There is currently no official Yukon Government policy for purchasing environmentally preferable products. Despite the lack of an official policy the government does identify and purchase environmentally preferable products on an ad hoc basis, as evidenced by the cleaning and painting products used.

While it is possible to apply environmental criteria to almost all purchases, it is beyond the scope of this review to consider the hundreds of individual products purchased by the Department of Education. However, one product category that does stand out and deserve consideration is paper use.

Yukon schools and Department of Education offices use over 7 ½ million sheets of paper annually. This would equate to an estimated 900 trees if there was no recycled content in the paper (Conservatree). The current Yukon Government practice is to use paper with 30% post consumer waste (pcw) content, leaving over 600 trees being cut down each year to supply paper to the department.

When you consider that about 35% of the 4 billion trees harvested worldwide each year are cut to produce paper, reducing paper use by the department is an important goal.

## School Activities

Many of the positive environmental activities happening in Yukon schools are the result of the efforts of the people who work and learn in the schools. Recycling and composting programs, waste reduction initiatives, and Green School recognition programs are active in many Yukon schools, and it is most often individual teachers, students, administrators and other school staff that are responsible. Schools were asked to complete a survey that is the basis for much of the information on day to day activities that follows.

### Outdoor Experiential Learning

Most Yukon schools offer outdoor experiences for their students. Almost 40% of the schools report that students regularly participate in environment focused or wilderness field trips, while another 50% have some opportunities to participate in these kinds of activities. Culture camps, bison hunts, wildlife viewing, and hiking, biking and canoeing trips are among the many activities taking place.

In many Yukon schools, these outdoor experiential activities are supplements to the regular classroom instruction. In a number of Yukon schools, however, separate formal outdoor experiential programs are offered that typically combine an Outdoor Education and/or Physical Education credit and Science and Social Studies courses. The teachers integrate all of the subjects together combining classroom instruction with a significant number of outdoor activities.

Instead of getting all of their instruction from teachers and textbooks in a classroom, students might study alpine plants as they hike up a Yukon mountain, or learn about the impacts of climate change by studying real life examples. A single teacher instructs each of these programs, giving them the flexibility to spend as much time as needed studying a particular area rather than being bound by strict schedules.

Most of these courses run a full semester, and students are required to complete compulsory courses in the other semester.

The first outdoor experiential course was developed at F.H. Collins Secondary School in Whitehorse. In 1989 the ACES 10 program was operating from the Wood Street Centre, and the Experiential Science 11 program was developed in 1994. Today, formal outdoor experiential courses are offered at a handful of

schools in Whitehorse, and a new Outdoor Pursuits 9/10 program is offered at St. Elias Community School in Haines Junction. Outdoor experiential programs include:

**Outdoor Pursuits & Experiential Science 9 (OPES 9)**

This course for students from F. H. Collins is offered at Wood Street Centre and combines:

- Social Studies 9
- Science 9
- Physical Education 9
- Outdoor Pursuits 9

**Plein Air & Sciences Experientielles 9 (PASE 9)**

This course offered at Wood Street is also for students from F. H. Collins and is similar to OPES but is offered with French Language instruction.

**Achievement, Challenge, Environment & Service 10 (ACES 10)**

The ACES 10 program is available at Wood Street to all Yukon students and includes credits for:

- Social Studies 10
- Science 10
- Outdoor Pursuits 10
- Physical Education 10
- Applied Skills 10

**Experiential Sciences 11 (ES11)**

Offered at Wood Street for all Yukon students, the ES11 program combines:

- Biology 11
- Chemistry 11
- Forestry 11
- Physical Education 11
- Art & Field Methods 11

**Vanier Experiential Science Option**

Vanier offers a half day program that combines:

- Biology 11
- Geography 12
- Outdoor Education 11

**Outdoor Pursuits 9/10**

Relatively new, this program offered at St. Elias Community School includes the following courses:

- Science 9
- Social Studies 9
- Field Studies 10
- Applied Skills 10
- Physical Education 9/10 (depending on the grade level of the student)

St. Elias will be offering an Experiential Sciences 11/12 next year that will be similar to the ES11 program at Wood Street with the following courses:

- Biology 11
- English 11/12 (depending on the grade level of the student)
- Sustainable Resources 11
- Geography 12
- Physical Education 11/12 (depending on the grade level of the student)

As a smaller school, St. Elias plans to offer the Outdoor Pursuits 9/10 and the Experiential Sciences 11/12 in alternate years, rather than at the same time.

## Leadership and Partnership in Environmental Initiatives

Yukon schools are full of teachers and students that are passionate about the environment. They are leading environmental activities within the schools, and are working with partners outside of the school to enhance environmental activities in their school building and learning opportunities for the students.

Almost one third of Yukon schools surveyed had an environmental committee or similar group. All but one of these schools identified an individual teacher who is a leader in environmental activities. Clearly, the strong commitment that these teachers have to the environment has been a benefit to their students and their school.

Community partners are making a strong contribution to the activities of these environmental leaders. Over 80% of Yukon schools work with outside organizations on environmental initiatives or learning, and almost half of these schools do it on a regular basis. The list of partnerships is long, and includes activities with government departments and agencies such as Parks Canada, Department of Fisheries and Oceans, Environment Yukon, Yukon First Nations and local municipalities.

Parks Canada is particularly active, especially in the communities where it has parks or historic sites. Parks Canada will send staff into the classroom to offer the Grade 7 Kluane Kokanee program and Grade 8 Kluane Bear program. These programs have been offered annually in Whitehorse and Haines Junction, and starting in 2009, will be available every two years in Teslin, Atlin, Carcross, Watson Lake, Carmacks

and Dawson. In Old Crow, Parks Canada staff offer the Vuntut Bear program and the Vuntut National Park Wildlife program to students on request.

Site visits for Grade 3 & 5 students to the S.S. Keno in Dawson, and Grade 6 student visits for the Kluane Fire program offer experiential learning opportunities for Yukon students.

Non government partners include Raven Recycling, local Renewable Resource Councils, and the Yukon Outfitters' Association. The Yukon Wildlife Preserve offers a general day long program for grade 4 students, and since 2004 over 1000 Yukon students have participated. In 2008, the Wildlife Preserve developed four programs for secondary school students as part of their environmental science monitoring program. Each spring, Grade 8 students observe the relationship between weather and water, Grade 9 students sample aquatic invertebrates, Grade 10 students do water quality analysis, and Grade 11 students study aquatic plants.

### SEEDS Green Schools

The Society, Environment, and Energy Development Studies Foundation (SEEDS) is a non-profit foundation established in Edmonton in 1976 by members of the oil and gas industry. The Board of Directors is made up of representatives from the energy industry, academics, and environmental organizations.

In addition to curriculum resources on energy, habitat and climate change, the SEEDS foundation created a Green School program. Schools register in the program and achieve different recognition levels by completing environmental projects. Projects are considered to be any "environmental project completed by a group of students." These could include a school yard litter pick up, tree planting on the school grounds or hallway displays on environmental themes. SEEDS provides a Green School resource kit when schools register, and Green School banners and certificates upon completion of the various levels.

Over half of Yukon schools are involved in the SEEDS Green School program. Leading the way is Selkirk Elementary School which as of January 2009 is one of only fourteen "Earth II" schools in Canada. The award levels and Yukon school participants are listed below:

**Green School** (100 completed projects)

- Grey Mountain Primary School
- Ross River School, Teslin School
- Watson Lake Secondary School
- Whitehorse Elementary School

**Jade School** (250 completed projects)

- École Émilie Tremblay
- Hidden Valley Elementary School
- Johnson Elementary School
- Robert Service School

**Emerald School** (500 completed projects)

- Elijah Smith Elementary School
- Golden Horn Elementary School

**Earth School** (1000 completed projects)

- Holy Family Elementary School
- Jack Hulland Elementary School
- Takhini Elementary School

**Earth II School** (2000 completed projects)

- Selkirk Elementary School

### Solid Waste Management

Anecdotal information on waste management in Yukon schools is easily available. It is not possible, however, to gather specific data on waste management in the school system. Waste is generally picked up from schools by private contractors based on a fee per pickup, rather than on volume or weight, so no information on the amount of waste generated by Yukon schools is available. Similarly, where recycling and composting programs exist, the actual amount of waste diverted is not typically measured.

### Recycling

Almost every school in the territory recycles, although there are different levels of recycling taking place. The only two schools that do not have a recycling program are in Old Crow and Beaver Creek, where a lack of regular recycling in the community makes a school based program very challenging.

Of the schools that do recycle, each collects refundable drink containers that can be returned for deposit. About 80% of the recycling schools also collect paper for recycling, and 70% of the recycling schools collect plastic, glass and cans. Three of the schools rely on individuals doing their own recycling, while the majority have an established recycling program organized by staff, teachers, and/or students.

The actual recycling collection systems vary from school to school. Some schools provide various recycling receptacles in every classroom, while others provide a central location for recycling, and many provide both. The popularity of the various recycling collection systems is outlined below.

| Type of Recycling | Collection in Every Classroom | Central Collection | Both |
|---|---|---|---|
| **Refundables** | 67% | 75% | 46% |
| **Paper** | 67% | 75% | 50% |
| **Plastic, Glass and Cans** | 33% | 50% | 33% |

Recycling participation rates are quite high. Over 80% of schools estimate that the majority of students, teachers, and other staff recycle regularly.

### Composting

Over 60% of Yukon schools have some type of composting program. Of the schools that do compost, just under half of them compost food only, while the rest of them compost food, paper towels, and other compostables.

As with the recycling, compost collection systems vary in different schools. Almost 40% of the schools have one central composting location, while the remaining 60% of the schools have various compost collection locations.

The composting participation rate is somewhat lower than the recycling rate. Just over half of the schools surveyed report that the majority of students, teachers, and other staff compost on a regular basis. About 30% of the schools report an average participation rate, while the remainder report a low participation rate.

### Other Waste Management Initiatives

Waste free lunches have become a popular event at some schools. Students and parents are encouraged to reduce school waste by using reusable containers for food. Over half of Yukon schools organize waste free lunches, and several do so on a regular basis. The actual amount of waste generated by the school lunches may not change much if students and parents are simply removing packaging at home before sending the food to school, but these events can be useful opportunities to educate and remind students and parents about waste reduction.

Every school surveyed indicated that they practice some two sided printing. Almost 85% of them print on both sides of the paper some of the time, while about 15% of Yukon schools print of both sides of the paper all of the time.

The majority of schools also use reusable dishes at least part of the time. Only one school reported that they only use reusable dishes, and only one school reported that they only use disposable dishes. The rest use a mix of reusable and disposable dishes. Of these, about two third mainly use reusable dishes and the remaining third use disposable dishes most of the time.

## Recommendations for Implementing an

## Environmental Stewardship Framework

In recent years, there has been a greater understanding of the need to change the way we live our daily lives, operate our businesses, and run our governments. Simply put, the planet cannot continue to provide resources at the rate our ever increasing population is consuming them. Neither can it continue to absorb the amount of waste that our society produces.

Changes are happening all over the world, as renewable energy sources and technologies are being developed, and sustainable harvesting practices are being implemented. People are reducing the amount and toxicity of the waste they produce, and working to minimize the degradation of our natural areas.

While many good things are happening, the change to a sustainable society will not happen overnight. Most people recognize that we must lessen our dependency on fossil fuels and they understand that we cannot continue to consume renewable resources at a rate greater than the rate at which they renew themselves.

Still, familiar practices and habits are difficult to change, and our systems of production and transportation are well established. We need to change the process by which decisions are made by incorporating the full economic, environmental and social implications of our actions into our decision making process.

The development and implementation of an Environmental Stewardship Framework by the Yukon Department of Education must be considered in this context. It will be challenging, and it will take time. There are actions that can and should be taken in the short term, but the full transition to a sustainable organization will take years. By definition, the success of a sustainability program can only be realized over the long term, and the actions of the department in implementing the framework should be judged over the long term.

Most government or private sector organizations that have taken serious steps towards sustainability have made mistakes along the way. The same should be expected in the case of the Department of Education. It is not possible to chart a new course without the occasional misstep.

Although there are some exceptions and some overlap, the recommendations that follow can generally be put in two categories.

First there are strategic, "big picture" recommendations that are critical to build the capacity, partnerships, and decision making processes within the organization that will allow it to become sustainable over the long term.

Secondly, there are specific operational recommendations that can be implemented as capacity and resources allow. These recommendations will ensure that more immediate benefits can be realized in the short term.

All of the recommendations should be considered in the context of four broad goals:

- Increase Environmental Literacy – It is important that all participants – school staff, students and departmental staff - have a common understanding and knowledge of environmental stewardship.

- Build Partnerships – Partnerships within the education system, among government departments and agencies, and with members of the larger community are critical. The Education Department does not function in isolation, and environmental stewardship can only be achieved through cooperation and partnerships.

- Integrate Green School Operations and Environmental Learning – The goal of greening Yukon schools requires the participation of teachers, students, businesses and communities. This also represents a significant learning opportunity as students can benefit from the real life, hands-on examples of environmental stewardship in their own schools.

- Do the Math – While some may view green capital projects as a cost, in reality, most environmental initiatives will result in savings over the long term. Accurately measuring, analysing and evaluating the financial implications of all decisions is essential.

## Strategic Recommendations

### Environmental Stewardship Manager

While a successful environmental stewardship initiative will require participation by many departmental staff, the task of running the full program cannot be done off the corner of someone's desk. If no single person, or team of people, is specifically responsible for stewardship activities, it is unlikely that significant, sustained progress will be made.

At least one full time position specifically dedicated to the program is required. The role of this position is not to do all of the activities, but to manage the Environmental Stewardship initiative by providing expertise, leadership and support to activities throughout the department and school system that build capacity and enable others to successfully engage in environmental stewardship actions.

The Environmental Stewardship Manager should work with partners, communities and staff including facilities managers, finance and human resource employees, and policy analysts to identify policies, procedures, and training required to implement the program.

The Manager should also work with curriculum consultants, teachers and administrators to develop environmental stewardship programs for schools, and work with communication staff to develop workshops and newsletters.

Recommendation:

- ❖ Create a position at the Department of Education to manage the Environmental Stewardship program.

## Environmental Literacy

A critical tool in the sustainability process is an increase in environmental literacy throughout the organization. In this context, environmental literacy means several things:

- An appreciation of the importance of environmental stewardship.
- An understanding of the connection between human actions and the environmental health of the planet.
- Knowledge of the activities and goals of the Department of Education's Environmental Stewardship initiative.
- Specialized knowledge related to job responsibilities that significantly impact the environmental stewardship initiative.

Organizational change cannot simply be mandated from the top down. Rather, the systemic move to sustainability can only be achieved through the full participation by all members of the organization. In the Department of Education, this includes the teachers, administrators, students and staff in the schools. It also includes staff that work in the Department of Education's offices in Whitehorse.

In addition to a general awareness and appreciation of environmental stewardship, some Department of Education staff will require specialized training to support their job requirements in an environmental stewardship program. This will include training in life cycle assessment, green building techniques and programs such as LEED, sustainable building operations, and environmental education. Staff positions that are especially relevant to implementing the stewardship initiative include those involved in finance, facilities, curriculum and policy.

Recommendations:

- ➢ Use presentations, workshops, regular newsletters and other communication tools to increase environmental literacy for all Department of Education staff, students, and members of the public.
- ➢ Identify key competencies required to implement the Environmental Stewardship successfully, and ensure an appropriate level of training for staff to meet these competencies is available.
- ➢ Formally establish a Green Action Committee in the Department of Education to meet the Climate Change Action Plan Commitment

## Yukon Green Schools

Other jurisdictions have recognized the value of involving students and staff in the greening of their school operations. It is obvious that the direct participation of students as well as school staff is required for activities like recycling and composting. It is just as clear that the behaviour of building occupants will have a considerable effect on water and energy use.

Without the support and participation of the people who learn and work in our schools, attempts to truly green school operations will be difficult, if not impossible.

The engagement of students and staff in greening their schools has more than just operational benefits. Building, operating and maintaining green buildings offers excellent learning opportunities. School energy and water use, waste diversion programs and green school grounds all offer learning opportunities for science, math, geography and other subjects.

The development of a Yukon Green Schools recognition program will encourage staff and students to participate and learn from the greening of their buildings. It also provides an important opportunity to recognize and celebrate the contributions of participants.

Recommendations:

- Develop a two level Yukon Green Schools recognition program. Schools should be required to demonstrate continued commitment and participation to maintain their status. The minimum requirements for the first level should include:

    - The establishment of a Green Team made up of students, teaching staff and custodial staff.
    - A commitment to participate in the monitoring of energy use, water use and waste diversion at their school.
    - A commitment to offer environmental education at all grade levels and across disciplines.

  The second level should include actions and achievements in a variety of areas including:

    - Energy Conservation
    - Water Conservation
    - Waste Reduction
    - Wilderness Learning Opportunities
    - School Ground Greening
    - Development of Community Partnerships related to Environmental Stewardship

The Yukon Green Schools program should also recognize excellence in environmental stewardship by individual students, teachers, and administrators in addition to the Yukon Green School designations.

## Partnerships

Just as it is critical that all the people who work and learn in the Yukon education system are involved in the shift to environmental stewardship, it is important that education partners are aware and involved in the process. Change is always challenging, even positive change such as increasing environmental stewardship.

The best way to build support and encourage participation in the environmental stewardship program is to engage partners and stakeholders as soon as possible. This early participation will not only increase the level of support for the initiative, but will likely increase the quality of the results. The many education partners and stakeholders will bring different perspectives, approaches, and ideas to the table that will add significant value to the program.

Another key partner is the Yukon Department of Highways and Public Works (HPW). HPW plays a significant role in most aspects of design, tendering, building and/or operation of education 'infrastructure." The department supervises the design, tendering, and building of new schools, as well as the maintenance of existing schools. Within HPW, the Supply Services Branch purchases the vast majority of items used in Yukon schools and in the Education offices.

Most of the recommendations in this report, as well as future environmental stewardship activities will require the participation and often the expertise of the Department of Highways and Public Works. The participation of the Yukon Department of Finance will also be critical to support the implementation of life cycle assessment for capital projects. The Energy Solutions Centre has technical expertise that will support renewable energy and energy efficiency projects.

While numerous partnerships will develop through the implementation of an environmental stewardship framework, it is important to establish two key partnership groups at the beginning of the project.

Recommendations:

- Establish an Environmental Stewardship Advisory Committee made up, at minimum, of senior representatives from the Yukon Department of Education and representatives from the Association of Yukon School Administrators, the Association of Yukon School Councils, Boards & Committees, the Yukon First Nation Education Advisory Committee, and the Yukon Teacher's Association.

- Establish an internal Environmental Stewardship Working Group made up, at minimum, of senior representatives from the Yukon Departments of Education, Highways and Public Works, Finance, and the Energy Solutions Centre.

### Data Collection, Targets and Reporting

The collection and analysis of data is one of the most important tools in the process of becoming sustainable. Accurate information on resource use and the financial cost of resource use allows an organization to understand the scope of the challenges, identify and evaluate opportunities for improvement, and measure the success of any actions taken. This information also has the potential to change behaviour, as the children who learn in our schools, as well as teachers and others that work for the department gain a greater appreciation of how their day to day actions impact the environment.

Most of the data on resource use in the Department of Education is collected as part of the process of paying the utility bills. Water bills from the City of Whitehorse include the usage every two months, and regular oil, propane and electrical bills obviously include the amount of energy provided. Information on waste is not currently available.

However, this information is not generally compiled or tracked by the department, and it is not shared with building occupants. While the Energy Solutions Centre has recently collected energy use data for Yukon schools dating back to 2000, this represents a relatively new practice, and the data is not effectively incorporated into the regular decision making process of the department.

Recommendations:

- Establish a process for the regular collection of energy, water and waste data on a building by building basis.
- Establish medium and long term targets for the reduction of resource use in all buildings in all categories.

  The data and targets should be published as part of the Department of Education Annual Report. There should also be a central location established at each school and other Department of Education buildings to display the data and targets, and update it monthly to inform occupants and building managers.

### Life Cycle Assessment

The budgeting process that governments use is not conducive to sound financial decision making. In fairness, it should be noted that this statement applies to all governments, most corporations, and many individuals. Capital spending plans are usually developed completely separate from operations and maintenance (O&M) budgets, and the pressure is often on reducing the ostensibly large construction costs without full consideration of the O&M implications of the decisions.

While most people recognize there is a link between sustainable design and construction and lower utility costs, many do not realize how significant the savings can be. The International Facility Management Association (IFMA) calculates that the costs associated with operations, maintenance and replacement of building components over the first 30 years of a building are about 3 times the initial construction costs. If you include the salaries of the building occupants in a typical office building over the same 30 year time period, the initial construction costs represent about 2% of the total expenses, the operations and maintenance represent about 6% of the total expenses, and salaries and benefits make up the remaining 92% of the expenses (Sapp, 2009).

The life cycle cost of a building is the total cost of ownership of the building over its lifespan. It includes all of the expenses associated with the initial design and construction, as well as those related to the operations, maintenance, repair, replacement and eventual disposal costs of the building. The statistics quoted above show that considering the full life cycle cost of buildings benefits both the environment and the pocketbook. The Alaska Department of Education and Early Development has produced a Life Cycle Cost Analysis Handbook for Alaska School Districts.

A study completed for California's Sustainable Building Task Force found that on average, it cost only an extra 2% to build green compared to standard construction methods. The study went on to calculate that this minimal investment of 2% in construction costs would result in savings of more than 20% in life cycle costs over the first 20 years. (Kats, 2003) Using these numbers, a $10 million Yukon school built to LEED standards might cost about $200,000 more to design and build, but it could offer savings of over $2 million during the first 20 years of operation.

Recommendation:

- Fully incorporate Life cycle assessment into new school planning and design, as well as all significant capital maintenance decisions at existing schools.

### Measuring Success in Environmental Stewardship

As noted earlier, it is critical to be able to measure the baseline situation and the results of the ongoing changes being made in an environmental stewardship program. This provides data for strategic decision making, as well as for evaluating the environmental and financial success of the actions being taken.

Establishing a methodology for evaluating success also allows all participants, whether they are students, teachers, parents or Department of Education staff, to understand the value of the program and the implications of their own actions. Setting goals and targets can encourage participation and increase enthusiasm.

The collection and analysis of energy use, water use and waste diversion on a building by building basis will provide one measure of success. The implementation of full life cycle assessment for capital projects will automatically provide a method to assess the financial implications of all capital decisions.

Under the Yukon Climate Change Action Plan, the Yukon Government will be monitoring its greenhouse gas (GHG) emissions. The government has committed to cap internal GHG emissions next year, and has set targets of reducing GHG emissions by 20% by 2015, and becoming carbon neutral by 2020. Although the details of the GHG monitoring and reporting have not yet been finalized, it should be expected that the Department of Education will have monitoring and reporting requirements under the Climate Change Action Plan.

Ecological Footprint is a metric developed to calculate the demand that humans have on the earth. It calculates the area required to produce the biological resources a country, city or organization uses, as well as the area required to absorb its waste. This is then compared to the area available.

Calculations show that humans currently use about 40% more resources than the earth can sustainably provide. Canada, like most developed countries, consumes a significantly higher amount, using over three times the resources per capita than the earth can provide.

The ecological footprint is a valuable tool for a number of reasons. It considers many aspects of human consumption beyond our carbon footprint. It provides an easy to understand number and concept that can be used as a valuable teaching tool. It allows for simple comparisons to other jurisdictions, and provides a powerful environmental and ethical argument for reduced consumption.

Given the level of reporting already recommended, the other substantive recommendations of this report, and the potential monitoring and reporting requirements of the Yukon Government GHG emission targets, developing an Ecological Footprint program for the Department of Education may be too much in the short term.

Once baseline data and ongoing monitoring for energy, water and waste is established, and government GHG emission calculations and methodology are confirmed, using the Ecological Footprint metric may be a logical progression.

## Operational Recommendations

### New School Sites

The specific site chosen for a new school has different environmental impacts depending on whether it is a Greenfield site – a previously undeveloped area – or a Brownfield site that is being redeveloped. Beyond the positive environmental and community benefits of maintaining green spaces in their natural state, redeveloping previously occupied sites often offers lower servicing costs as existing infrastructure is already in place.

The location of a new school will influence transportation choices and patterns in a neighbourhood, in the case of a smaller elementary school, and community wide in the case of a new secondary school in Whitehorse. This will be true not only for students and staff getting to schools, but for the whole community for events after school hours. This impact could be felt for 60 years or longer, depending on the lifespan of the building.

Many schools function as community centres where sports groups and other community organizations use facilities on evenings and weekends. This ability of school buildings to function as a critical community resource should be recognized and expanded upon. Rather than duplicating facilities, especially in smaller communities, the Department of Education should work with other governments and groups to provide the needed facilities in a community in the most efficient way possible.

Recommendation:

- Choose new school sites to minimize the environmental impact of the building and to increase overall community sustainability. This includes:
    - Working with Municipalities, First Nations, the Yukon Government, and community groups to design multi use schools to efficiently meet community infrastructure requirements.
    - Building new schools on previously developed land wherever possible.
    - Choosing the most central location feasible for new school construction to facilitate walking and reduce driving in the community.
    - Evaluating the availability of existing and future public transportation when choosing a new school site.

## New School Buildings

The Yukon government has made a commitment to build all new government buildings to a minimum LEED (Leadership in Energy and Environmental Design) certified level. This will be based on the Canada Green Building Council's (CaGBC) LEED for New Construction (LEED NC) rating system. The US Green Building Council (USGBC) has developed a LEED for Schools certification program that is based on the LEED NC program.

The LEED for Schools includes a number of clarifications and modifications of credits, as well as three new prerequisites and a number of new optional credits. The changes and additions generally make the building more conducive for learning, and also reflect the fact that the building occupants are children, who can more vulnerable to poor air quality.

The new prerequisites include requiring an environmental site assessment prior to construction to protect children's health, the designation of the school as a non-smoking building, and minimum acoustical performance for classrooms.

The optional credits that are new or amended include points for the joint use of the facility with community groups, and for integrating the sustainable features of the building into the curriculum. There is also a greater focus on indoor air quality through the materials used in construction of the building and to furnish the school, and an increased emphasis on natural daylight and outside views for classrooms.

While it is not possible to achieve LEED for Schools certification in Canada at the current time, the similarity of the LEED for Schools and the LEED NC program will allow the use of the U.S. LEED for Schools rating system as an advisory document.

Recommendation:

- Use the USGBC LEED for Schools as an advisory document in the construction of new schools while meeting LEED NC Silver level.

### New School Form and Orientation

While technology has improved over the years, and our knowledge of building science has increased, the sustainability of a building isn't just a result of high tech products and complicated calculations. In fact, as noted earlier, data from Yukon schools reveals that some of the oldest schools in the territory are also some of the most efficient. There are many variables that impact the energy efficiency of a building, and several of them are low tech and carry no significant costs.

While there are many factors that influence a heat loss calculation of a building, there are three that have the biggest impact. One is the components of the building envelope – the insulation levels in the walls, ceilings, and floors and the windows. Another is the level of air infiltration which is a reflection of both the materials used and especially the quality of construction. The third is the amount of area of the building that is exposed to the outside.

While it may be obvious that the smaller the area of a building that is exposed to the elements, the less a building loses heat, it bears repeating. Buildings with a more compact form use less energy than similarly constructed buildings with a larger footprint. This fact has not been given enough consideration in the design of some schools in the Yukon.

While compact building strategies such as building multiple story schools will come with the added cost of elevators and other accessibility issues which must be addressed, these expenses should be more than balanced by reduced construction costs due to less wall, foundation, and roof areas.

Another frequently forgotten factor in building efficiency is solar energy. Even in the north, the potential for passive solar gain is significant. While the short days in the middle of the winter don't provide a lot of solar heat, the longer days in the fall and especially in the spring months provide significant amounts of passive solar heat at a time when the heating demand on our buildings is still quite high.

In addition to the heat gain, passive solar design offers opportunities to maximize natural daylighting and further reduce energy costs.

Recommendations:

- Design new schools with a compact footprint through minimizing external wall areas and building multiple stories where appropriate.

- Design new schools to maximize passive solar heat gain.

### Existing School Energy Use

There is a significant difference in energy consumption in the different schools in the Yukon, with the worst performing school using more than twice as much energy per square foot as the best performing school. While we are able to calculate the average energy use per square foot based on utility bills fairly easily, the reasons for the relative energy efficiency of each school are not always so clear. A detailed inventory and evaluation of the building envelope, equipment and fixtures for each school does not exist.

There are significant environmental and financial advantages to increasing the energy efficiency of Yukon school buildings. At current costs, the Department of Education spends well over $4 million per year on energy. While much of the electricity used is renewable hydro electricity, almost 2,000,000 litres of heating oil, and more than 600,000 litres of propane are used each year in Yukon schools. Without an accurate picture of each building, it is not possible to make specific recommendations for changes to individual schools.

In the 2008/2009 fiscal year, the Department of Education spent about $3 Million on capital maintenance to paint, repair and replace school building components. Of that money, less than $50,000 was spent on energy efficiency initiatives. While energy efficiency improvements will save money in the long term, they usually require a short term capital investment.

Revolving funds that support energy and water efficiency are replenished by the savings realized by the building improvements. A onetime dedication of financial resources can then support efficiency improvements over a long period of time. Accurate baseline data is required, as is a careful analysis of potential projects to ensure a level of payback that maintains the fund.

Recommendations:

- Conduct comprehensive energy audits of all Department of Education buildings. Audits will reveal specific energy and cost saving opportunities including:
    - Replacing all remaining T12 fluorescent fixtures with T8 fluorescent fixtures.
    - Installing motion switches in all appropriate areas such as washrooms and storage rooms and other areas without natural lighting.
    - Installing occupancy switches in all appropriate areas such as classrooms and other areas with significant natural lighting.
    - Installing dimming ballasts in all appropriate areas such as classrooms and other areas with significant natural lighting.
    - Installing heat recovery and/or demand controls on all building ventilation.

- Installing programmable setback thermostat controls in all appropriate areas.

- Create a School Energy and Water Efficiency Revolving Fund equal to approximately 10% of annual expenditures on energy and water.

- Establish acceptable lighting levels in various school locations using the Illuminating Engineering Society of North America's (IESNA) recommendations. Remove and/or replace lamps where light levels exceed the established requirements.

### Renewable Energy

While reducing energy demand by implementing energy efficiency improvements should always be the first step, there are also opportunities to replace the use of fossil fuels with renewable energy in some Yukon schools. There are challenges with wind energy and solar photovoltaic panels (solar panels producing electricity) in the Yukon, but these may ease over time if wind technology improves to make low speed wind generation viable, and photovoltaic prices drop.

Solar thermal panels which provide domestic hot water generally make financial sense even in the north. A properly sized system can provide half or more of the annual hot water demand while providing a reasonable life cycle cost compared to other options. However, solar thermal may not make as much sense for schools.

The typical system that might provide 50% of the annual demand for hot water is obviously very effective in the summer months, when it will actually provide about 75% or more of the demand. Solar thermal installations on schools buildings that do not have a significant demand for hot water in July and August will have a longer payback, and will not make as much sense from a life cycle cost perspective.

There are two separate warm water aquifers in the Riverdale area. In 2003, a hydrogeological assessment was done in the area of Vanier school. This study identified a sufficient resource in the Selkirk aquifer to meet the heating demand for the school (Gartner Lee Limited, 2003). Two subsequent cost benefit analysis studies were completed in 2003 and 2005. The most recent report estimated a capital cost of just over $860,000 to install geothermal heat and annual savings of just over $60,000 with a simple payback of about 14.2 years. The fuel cost used in the analysis was 67.8 cents per litre, and a life cycle assessment was not conducted (Earth Tech, 2005).

A wood fired biomass heating system was installed at Elijah Smith School a number of years ago. Wood heating is considered greenhouse gas neutral and usually provides significant savings over fossil fuel based heating. The system at Elijah Smith was eventually shut down due to wood quality issues and equipment problems. The Energy Solutions Centre has recently completed a feasibility study of installing biomass boiler systems at Elijah Smith and Hidden Valley schools. The study suggests that converting both schools to biomass boilers would result in significant savings (Ventek Energy Systems, 2009).

There are several other communities in the Yukon with warm water aquifers including Haines Junction and Mayo. The St. Elias School in Haines Junction in particular is a good candidate for ground source heat as the aquifer beneath that community is about 17 degrees Celsius. Biomass heat is an option throughout the Yukon.

Renewable energy offers environmental and often economic benefits. The department should act on the projects that have been identified at Vanier, Elijah Smith, and Hidden Valley and consider renewable energy projects throughout the Yukon where they are viable.

Recommendations:

- Conduct a life cycle assessment on installing solar thermal panels on Yukon schools.
- Re-evaluate the Vanier Catholic Secondary School ground source heat project by doing a life cycle assessment using current fuel and installation costs and recent heating demand data.
- Install biomass boilers at Elijah Smith Elementary School and Hidden Valley Elementary School.

## Water

Water consumption in Yukon schools, even more than energy consumption, varies widely between schools. Calculated as the average amount of water used per student each day they are at school, the water use at the least efficient school is almost 18 times higher than the water use at the most efficient school.

The comparisons between schools may be an inaccurate representation of actual student water use in some cases. Some schools use "bleeding" to ensure that pipes don't freeze in the winter time. Many schools use a significant amount of water for irrigation, but most of these don't have the ability to distinguish indoor water use from outdoor water use.

As with energy use, the most important thing to increase water efficiency is a more accurate picture of current use.

While the costs associated with water use are nowhere near as significant as energy costs, the department still spends about $100,000 on water annually in Whitehorse schools. It is likely that charges for water and wastewater treatment will increase significantly in the future as municipalities deal with stricter water and wastewater quality regulations and the repair and replacement of aging infrastructure.

Municipalities are also beginning to get a better understanding of the full life cycle costs of water and wastewater infrastructure, and this will also likely lead to increased charges for water in the future.

In many cases, the retrofits to reduce water use are easy, low cost actions. Again, specific recommendations for individual schools will follow from the completion of water audits.

Recommendations:

- Ensure that all schools have water meters for both regular water use and irrigation.
- Conduct comprehensive water audits of all Department of Education buildings. Audits will reveal specific water and cost saving opportunities including:
    - Installing low flow shower heads on all school showers.
    - Installing low flow aerators on all school faucets.
    - Replacing high flow toilets with low flow toilets.
- Retrofit one school with waterless urinals as a pilot project.
- Eliminate or reduce "bleeding" at schools wherever possible.

### School Grounds

While grass is required for playing fields, many of the lawns surrounding our schools serve no specific purpose. They require irrigation, fertilizer, and regular cutting to maintain them. The seeds planted are not likely to be indigenous to the Yukon.

While planting grass seed or installing sod may seem like the easiest, most cost effective approach to ground cover, the cost of watering, fertilizing, and cutting the grass over the lifetime of a school building is significant.

The alternative is to plant school grounds with drought resistant indigenous plants. While no data is available for local "resource conserving landscaping," studies in southern conditions show that a mature native landscape can save up to $10,000 per hectare in annual maintenance costs (Conservation Design Forum, 1996).

The U.S. Environmental Protection Agency's GreenScapes program offers advanced tools to calculate the potential cost savings and other benefits of converting to resource conserving landscaping.

In addition to the cost savings and environmental benefits, school grounds planted with indigenous plants offer a learning environment for students, and a potential fit with school composting projects.

Recommendation:

- Replace all non essential lawn areas with resource conserving landscaping at a Yukon school as a pilot project after completing a life cycle assessment.

## Pesticide Use

While there may be infestations that require pesticide use in schools, it should always be the last option. Preventing the development of conditions that encourage pests, or correcting existing problems that allow pests to gain access to schools is the first solution. In Yukon schools, the conditions that support pests include:

- Improperly stored recycling and compost that provide a food source for ants.
- Foundation cracks and leaky pipes that create a moist environment for silverfish, sow bugs and other insects to breed in.
- Dirty sink drains that allow drain flies to breed.
- Structural building problems such as improperly installed or damaged door sweeps that allow rodents to enter.

Integrated Pest Management is an approach that includes regular monitoring and record keeping as tools to aid in pest control. Physical, mechanical and educational methods to deal with pests are employed as a first response. Chemical methods of pest control are used only when other responses fail, and monitoring suggests that the pest will cause unacceptable economic, aesthetic, or medical damage. Finally, the least toxic chemical solution that is effective is chosen.

While reports on pesticide use in schools must be submitted to the Department of the Environment, that information is not currently provided to the Department of Education. Again, the availability of the relevant data is critical to the ability to implement an Integrated Pest Management program.

Recommendation:

- Implement an Integrated Pest Management program for all Department of Education buildings, and ensure all school pesticide use reports are provided to the Department.

## Cleaning and Maintenance

The products used in the regular cleaning and painting in Yukon schools already make a strong contribution to the environmental stewardship of the department. The cleaning product Green Unikleen is EcoLogo and Green Seal certified, and the General Paint product is rated as Zero VOC.

Whether the presence of titanium dioxide in the paint is a concern is unclear at this point. If future studies do reveal a threat to human health associated with titanium dioxide, its use in food and skin creams would be of much greater concern. At this time, even organic paints contain titanium dioxide. Still, it would be worthwhile to monitor ongoing research into the potential health effects of titanium dioxide.

In both cleaning and painting, the environmentally preferable products have come into use in the absence of any official policy. While there is no reason to expect that their use would change, it

would be advisable to confirm this through adoption of Education policies guiding cleaning products and paints.

Recommendations:

- Establish Department of Education policies requiring that all cleaning products used in schools and other Education buildings are EcoLogo certified, and all paints used in schools and other Education buildings contain 5 grams/litre VOCs or less.

### Waste Management

Almost all schools in the territory participate in recycling, and many also operate a composting program. These programs are organized and operated by volunteers. Students, teachers, and other staff participate because of a strong belief in environmental stewardship.

Waste diversion programs such as recycling and composting should be considered a corporate responsibility like waste disposal and school cleaning. The Departments of Education and Highways and Public Works should consider waste diversion as a critical part of an integrated waste management program that includes source reduction, diversion and landfilling.

In addition to the environmental benefits, waste diversion will have economic benefits. The Department of Education pays private contractors to collect and dispose of school waste. Most of the cost of disposal is determined by the pickup schedule and the actual weight of the waste. Decreasing the waste being sent to the landfill can obviously decrease both the number of times a school requires pickup and the actual weight of the waste going to the landfill thereby saving money.

The biggest difficulty with realizing potential savings associated with waste diversion is the inability to actually measure waste. Schools do not have the capacity to measure either waste or diverted waste, and although the companies that haul school waste to the landfill are charged a tipping fee based on weight, they typically are not able to apply the measured weight to specific clients.

Developing the ability to measure both the amount of waste sent to the landfill as well as the amount of waste diverted is critical to determining both the environmental and economic success of waste diversion programs.

Recommendations:

- Develop the capacity to measure the amount of waste being diverted and the amount of waste going to the landfill.
- Consider waste diversions practices such as recycling and composting to be a corporate obligation. This will require that:
    - Building custodial contracts include waste diversion responsibilities.
    - Future waste disposal contracts allow for the pickup of recycling and composting.

- Future waste disposal contracts include escalator clauses based on the number of pickups and the weight of the waste.

- Develop a comprehensive, standardized waste diversion program that can be adapted for all Department of Education buildings.

- Ensure schools are still able to collect the fees for refundables through participation in recycling to support programs and activities.

## Purchasing

Supply Services is currently developing a Green Procurement Policy that will be used by all departments in the Yukon Government. A green procurement policy should establish a standards based approach to purchasing that considers the full life cycle of goods, from raw materials through manufacture, transport and use, and ultimately the final disposition of the goods at the end of their lifespan.

The Department of Education does not need to wait to incorporate environmental stewardship into its purchasing practices.

The most significant purchasing area that is relatively easy to improve is the over 7 ½ million sheets of paper used in the schools and Education offices every year. The government currently purchases 30% post consumer waste (pcw) paper, while 100% pcw paper is readily available.

100% pcw paper typically has a price premium of between 10% and 20%. There are, however, actions that can be taken that will reduce the amount of paper used by much more than 20%. Reducing the margins to 0.75" on printing projects will result in estimated paper savings of almost 5%. More significantly, duplex printing (printing on both sides of the paper) instead of single sided printing will result in reducing the use of paper by almost 50%.

Combining paper use reduction strategies with a move to 100% pcw paper should result in a net financial gain for the department, while making a significant environmental improvement.

The U. S. Environmental Protection Agency has developed Comprehensive Procurement Guidelines that are mandatory for federal, state and local agencies in the U.S. The Guidelines cover 8 purchasing categories and offer recycled content recommendations and a database of goods and suppliers. The guidelines are reviewed regularly, and the substantial purchasing power of the various agencies ensures that the recommended products are available and cost competitive.

Recommendations:

- Implement a policy to purchase only chlorine free, 100% pcw paper, while simultaneously implementing a paper use reduction strategy across the department that includes:

- Ensuring all printers used in schools and Education offices are capable of automatic duplex printing.
- Setting the default printer settings to narrow margins and duplex printing on all computers used in schools and Education offices.

➢ Use the EPA Comprehensive Procurement Guidelines as a minimum standard while the Yukon Government Green Procurement policy is being developed.

## School Busing

The occupancy rate for school buses in the Yukon is quite low at just 57%. It is difficult to improve the occupancy rate in the smaller communities outside of Whitehorse that have only one or two routes, especially when the department doesn't control the size of school buses operated by the private contractors.

Whitehorse is a different story. With 38 routes in the Whitehorse area operating at only 61% capacity, there is significant room for improvement. There are several reasons to increase this occupancy rate. They include reducing the environmental impact of the buses, as well as decreasing the current $2.5 million/year cost to provide school bus service in Whitehorse.

There are, however, a number of challenges in increasing the efficiency of the system. The department does not currently have the ability to map the existing school bus routes, which makes identifying potential efficiencies more difficult. They also do not have comprehensive school bus policies that can be applied to route design and schedules. The school bus routes in use today have been developed over many years as various schools were built. They evolve only incrementally and mostly on an ad hoc basis.

At least two companies offer school bus route software designed specifically for small jurisdictions. VersaTrans and Edulog software should be evaluated by the Department of Education.

Recommendations:

➢ Develop or purchase the ability to map Whitehorse school bus routes.

➢ Establish a Whitehorse School Busing Committee made up of representatives from the Department of Education, the Association of Yukon School Administrators, the Association of Yukon School Councils, Boards & Committees, and the City of Whitehorse Transit.

In time for the tendering of a new Whitehorse School Bus Contract beginning in the 2011/12 school year, the Whitehorse School Busing Committee should develop:

- A Comprehensive Whitehorse School Bus Policy that includes defined coverage areas, maximum walking distances to bus stops, and establishes appropriate distances from schools where school

busing is not provided. The Committee should consider City of Whitehorse Transit as an option for senior students.

- A new Whitehorse School Bus Route Map designed to provide safe and effective student transportation while decreasing the number of routes and increasing the occupancy rate of the school buses. The Committee should consider staggered school start and finish times as a tool to increase efficiency.

➢ Introduce energy efficiency provisions including anti-idling, school bus sizes, driver training, and engine efficiency into the next school bus tender process.

## School Programs

### Experiential and Outdoor Education

The existing outdoor experiential programs offered in the territory are a great success story. The programs are popular with students and there are about twice as many applicants for the ACES 10 program and the Experiential Science 11 programs at Wood Street as there are spaces. The development of the experiential programs focusing on environmental learning at Porter Creek Secondary, École Émilie Tremblay and Vanier Catholic Secondary schools illustrate the popularity and growing demand for these types of courses.

Although some students from outside Whitehorse participate in the programs offered at Wood Street and other Whitehorse schools, the majority of participants are from Whitehorse. The recent development of the Outdoor Pursuits 9/10 program at the St. Elias Community School in Haines Junction demonstrates the interest in other communities as well as the capacity that smaller schools have to deliver this kind of program.

The U.S. State Education and Environment Roundtable coined the term "using the environment as an integrating context for learning" to describe interdisciplinary, hands-on, learning based on environmental imperatives. This description would include the outdoor based experiential programs in the Yukon. Their study of 40 different schools involved over 400 students, 250 teachers and administrators, and an analysis of standardized test scores, grade point averages, and attitudinal measures. It revealed substantial benefits to this approach to education (Lieberman & Hoody, 1998). Students involved in these programs show:

- Better performance in standardized tests in reading, writing, math, science and social studies.
- Reduced instances of discipline and classroom management problems.
- Increased engagement and enthusiasm for learning.
- Greater pride and ownership in accomplishments.

Wilderness experiences can also increase the appreciation that students have for the natural environment, and make them better environmental stewards through their lives.

Where there is demonstrated demand and support for the programs, the Education Department should make best efforts to provide the opportunity. Identifying financial resources and qualified teachers may be a challenge, and it is likely that expansion of outdoor experiential learning may need to happen over a number of years.

Outdoor experiential programs might not be the right approach for every student, or for every school. However, every student should be given the opportunity to participate in outdoor and wilderness experiences on a regular basis during their time in the Yukon school system. While all teachers can find more opportunities to teach their students outside of the classroom, certain activities have specialized equipment, instruction, and safety requirements.

The establishment of an Outdoor Education Specialist position would help ensure that all students have some opportunity to participate in outdoor programming. This position would travel to schools around the territory providing expertise and equipment to facilitate student wilderness activities. Regular teachers would be relieved of the time required to organize these kinds of activities, and students would benefit from the support of a fully qualified and certified outdoor educator.

Some jurisdictions use an outdoor learning centre to offer these outdoor opportunities to students. Typically, a centre would offer students a multiday program at several different grade levels to all students in the region. The advantages include established facilities and programs that provide a safe, well supervised outdoor experience with the absolute minimum extra work for local school administrators and teachers.

Some Yukon students would be required to travel long distances to a central outdoor centre, and every Yukon community is blessed with spectacular outdoor opportunities. Still, the establishment of an outdoor learning centre should remain an optional tool for meeting the goal of providing every Yukon student with regular outdoor and wilderness experiences through their time in school. Full consideration of an outdoor education centre should take place only after decisions on experiential program expansion and an Outdoor Education Specialist have been implemented and evaluated.

Recommendations:

- Expand the Outdoor Experiential Learning Programs to meet demand in Whitehorse.
- Continue to expand Outdoor Experiential Learning Programs outside of Whitehorse where there is a demonstrated demand and support of the School Council and staff.
- Create an Outdoor Education Specialist position to provide outdoor experiential programs in local school areas.

## Environmental Education in the Schools

Learning about the natural environment should not be restricted to special environmental courses or outdoor programs. Environmental learning should be integrated throughout the curriculum.

Virtually every course offered in the Yukon school system provides opportunities to teach students about our environment. There are obvious examples like Science, Geography and Social Studies, but even courses like Math and English can be enhanced by incorporating environmental lessons.

Teachers already have significant demands on their time. In addition to their regular teaching responsibilities, they volunteer for many other activities including coaching school teams, organizing student clubs, and chaperoning field trips. With all of the activities in schools today, it can be challenge to cover all required elements in a given course. The Department of Education should ensure that environmental learning does not become another extra responsibility for teachers.

There are many tools available to help do this. There is a remarkable amount of environmental resources already developed for teachers. Other education jurisdictions, government departments and agencies, and non government organizations have created a wealth of appropriate and interesting lessons and activities.

While it may be worthwhile to adapt some of the existing resources to connect them more closely to the Yukon, the Yukon Department of Education should not focus significant time or resources on creating new environmental learning resources.

However efforts should be made to connect these existing resources to what teachers are required to teach in the classroom. Each course taught in Yukon schools has a list of Prescribed Learning Outcomes (PLO) for the students. Teachers must ensure that the lessons they teach in the classroom allow students to realize these outcomes.

Since the Yukon follows the British Columbia school curriculum, it will benefit from the significant focus that the B.C. Ministry of Education is putting on environmental learning in their schools.

In 2007, B.C. developed an Environmental Learning and Experience Framework to help teachers include more environmental learning in the classrooms. They have recently completed "curriculum maps" which list the learning outcomes in every course that relate to sustainability and the environment.

Identifying the best environmental learning resources available and connecting them to the Prescribed Learning Outcomes mandated by the B.C. curriculum would allow teachers to incorporate these resources into their classroom without adding extra work for the teacher, or extra activities to an already busy school year.

Incorporating environmental lessons across the curriculum may be a new approach for some teachers. Professional development focused on integrating environmental education into the classroom would help them adopt new strategies and methods.

Recommendations:

- Adapt existing environmental learning resources to reflect Yukon conditions if appropriate.
- Connect existing environmental learning resources to B.C. Curriculum Prescribed Learning Outcomes.
- Offer Professional Development opportunities to Yukon Teachers focused on integrating environmental education into the curriculum.

## Links and Resources

### Calgary Board of Education

**CBE EcoTeam Home Page**
http://www.cbe.ab.ca/community/ecoStewardship/default.asp

**Environmental Stewardship Framework**
http://www.cbe.ab.ca/community/ecoStewardship/pdfs/Framework.pdf

**Environmental Stewardship Five Year implementation Plan**
http://www.cbe.ab.ca/community/ecoStewardship/pdfs/ImplementationPlan.pdf

### Maryland Association for Environmental & Outdoor Education

**MAEOE Green Schools Homepage**
http://www.maeoe.org/greenschools/

### Ontario EcoSchools

**Ontario EcoSchools Homepage**
http://www.yorku.ca/ecoschl/index.asp

### BC Ministry of Education

**BC Green Schools**
http://www.bced.gov.bc.ca/greenschools/

***Environmental Learning and Experience in Classroom: An Interdisciplinary Guide for Teachers***
http://www.bced.gov.bc.ca/environment_ed/environ_learning_exper.pdf

### Green School Buildings

**Advanced School Design Guide for K-12 School Buildings**
http://www.ashrae.org/publications/page/1604

**Energy Design Guidelines for High Performance Schools - Arctic and Subarctic Climates**
http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/34273.pdf

**Canada Green Building Council (LEED)**
http://www.cagbc.org/

**LEED for Schools**
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1586

**Collaborative for High Performance Schools**
http://www.chps.net/overview/index.htm

**Alaska Life Cycle Cost Analysis Handbook for Schools**
http://www.eed.state.ak.us/facilities/publications/LCCAHandbook1999.pdf

**The Costs and Financial Benefits of Green Buildings**
http://www.usgbc.org/ShowFile.aspx?DocumentID=1992

**Illuminating Engineering Society of North America**
http://www.iesna.org/

**U.S. Environmental Protection Agency GreenScapes Program**
http://www.epa.gov/waste/conserve/rrr/greenscapes/index.htm

**U.S. Environmental Protection Agency Comprehensive Procurement Guidelines: Product Resource Guides**
http://www.epa.gov/epawaste/conserve/tools/cpg/factshts.htm

## Curriculum

**Green Street**
http://www.green-street.ca/

**Pembina Institute – GreenLearning**
http://www.greenlearning.ca/

**Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning – Executive Summary**
http://www.seer.org/extras/execsum.pdf

## Works Cited


Canadian Centre for Occupational Health and Safety. (2007, March 9). *4-Working Safely with Titanium Dioxide* . Retrieved May 19, 2009, from Canadian Centre for Occupational Health and Safety: http://www.ccohs.ca/oshanswers/chemicals/chem_profiles/titanium_dioxide/working_td.html

Canadian Centre for Occupational Health and Safety. (2006, August). *Titanium Dioxide Classified as Possibly Carcinogenic to Humans*. Retrieved May 19, 2009, from Canadian Centre for Occupational Health and Safety: http://www.ccohs.ca/headlines/text186.html

Collaborative for High Performance Schools. (2006). *Best Practices Manual Volume III: Criteria.* Retrieved May 19, 2009, from Collaborative for High Performance Schools.

Conservation Design Forum. (1996). *A Comparison of Sustainable and Traditional Landscapes*. Retrieved May 19, 2009, from Conservation Design Forum: http://www.cdfinc.com/images/download/Sustainable_Landscape_Cost_Comparison.pdf

Conservatree. (n.d.). *Conservatree*. Retrieved May 19, 2009, from Trees into Paper: http://www.conservatree.org/learn/EnviroIssues/TreeStats.shtml

Earth Tech. (2005). *Yukon Vanier School Ground Source Heat Pump Engineering Analysis.*

Gartner Lee Limited. (2003). *Vanier School Ground Source Heat Pump Project - Hydrogeological Assessment.*

International Agency for Research on Cancer. (2006, February 27). *Titanium Dioxide.* Retrieved May 19, 2009, from International Agency for Research on Cancer: http://monographs.iarc.fr/ENG/Meetings/93-titaniumdioxide.pdf

Kats, G. (2003, October). *The Costs and Financial Benefits of Green Buildings.* Retrieved May 19, 2009, from U.S. Green Building Council: http://www.usgbc.org/ShowFile.aspx?DocumentID=1992

Lieberman, G. A., & Hoody, L. L. (1998). *Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning - Executive Summary.* Retrieved May 19, 2009, from State Education and Environment Round table: http://www.seer.org/pages/execsum.pdf

Sapp, D. (2009, March 31). *Facilities Operations & Maintenance.* Retrieved May 19, 2009, from Whole Building Design Guide: http://www.wbdg.org/om/om.php

Ventek Energy Systems. (2009). *Feasibility of and Options for a Public Bioenergy Heating Systems Retrofit (Draft).*